**United States Environmental Protection Agency**
**Region 6**

# Hurricane Harvey Response Support
# Site-Specific
# Uniform Federal Policy
# Quality Assurance Project Plan (UFP-QAPP)
# For
# Arkema, Inc.
# Surface Water Sampling

Prepared by:

**Weston Solutions, Inc.**
Region 6 Superfund Technical Assessment and
Response Team 4 (START 4)

**September 1, 2017**

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# LIST OF ACRONYMS

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| %D | percent difference |
| %R | percent recovery |
| %RSD | percent relative standard deviation |
| µg/kg | microgram per kilogram |
| µg/L | microgram per liter |
| AES | Atomic Emission Spectrometry |
| ANSI | American National Standards Institute |
| ARCS | Alternative Remedial Contract Strategy |
| ASQ | American Society for Quality |
| ASTM | ASTM International |
| B | bias |
| BFB | bromofluorobenzene |
| BS | blank spike |
| CA | Corrective Action |
| CAS | Chemical Abstracts Service |
| CCB | continuing calibration blank |
| CCV | continuing calibration verification |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CHMM | Certified Hazardous Materials Manager |
| CLP | Contract Laboratory Program |
| CPR | Cardiopulmonary Resuscitation |
| CO | Contracting Officer |
| CRL | Central Regional Laboratory |
| CVAA | cold vapor atomic absorption |
| CWA | Clean Water Act |
| D | laboratory duplicate |
| DFTPP | decafluorotriphenylphosphine |
| DI | deionized |
| DMC | deuterated monitoring compound |
| DMP | Data Management Plan |
| DQI | Data Quality Indicator |
| DQO | Data Quality Objective |
| DDT | dichlorodiphenyltrichloroethane |
| DUA | data usability assessment |
| ECD | electron capture detector |
| EDD | electronic data deliverable |
| EPA | United States Environmental Protection Agency |
| ERT | Environmental Response Team |
| ESAT | Environmental Services Assistance Team |
| FedEX | Federal Express |
| FEMA | Federal Emergency Management Agency |
| FID | flame ionization detector |
| GC | gas chromatography |
| GC/ECD | gas chromatography/electron capture detector |
| GC/MS | gas chromatography/mass spectrometry |

# LIST OF ACRONYMS *(Continued)*

| | |
|---|---|
| GPS | Global Positioning System |
| HASP | Health and Safety Plan |
| HDPE | high density polyethylene |
| HPLC | high performance liquid chromatography |
| HSO | Health and Safety Officer |
| ICB | initial calibration blank |
| ICP-MS | inductively coupled plasma/mass spectrometry |
| ICS | Incident Command System |
| ICV | initial calibration verification |
| IDQTF | Intergovernmental Data Quality Task Force |
| IDW | investigation-derived waste |
| IS | internal standard |
| LCS | laboratory control sample |
| LCSD | laboratory control sample duplicate |
| LEB | leachate extraction blank |
| LFB | laboratory fortified blank |
| LFSM | laboratory fortified sample matrix |
| LFSMD | laboratory fortified sample matrix duplicate |
| LLCCV | low level continuing calibration verification |
| LRB | laboratory reagent blank |
| MA | modified analyses |
| MB | method blank |
| MCL | maximum contaminant level |
| MDL | method detection limit |
| mg/kg | milligrams per kilogram |
| mL | milliliter |
| MPC | Measurement Performance Criteria |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| NA | not applicable |
| NCP | National Contingency Plan |
| ng/kg | nanogram per kilogram |
| OC | organochlorine |
| OSC | On-Scene Coordinator |
| OSHA | Occupational Safety and Health Administration |
| PAH | polycyclic aromatic hydrocarbons |
| PAL | Project Action Limit |
| PCB | polychlorinated biphenyls |
| PDS | post-digeston spike |
| P.E. | Professional Engineer |
| PE | performance evaluation |
| PM | Project Manager |
| PO | Project Officer |
| POC | Point of Contact |
| PPE | personal protective equipment |
| PQO | Project Quality Objective |
| PT | proficiency testing |

# LIST OF ACRONYMS *(Continued)*

| | |
|---|---|
| PTFE | polytetrafluoroethylene |
| PTL | Project Team Lead |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| QMP | Quality Management Plan |
| RCMS | Removal Cost Management System |
| RCRA | Resource Conservation and Recovery Act |
| RL | reporting limit |
| RML | Removal Management Levels |
| RPD | relative percent difference |
| RRF | relative response factor |
| RSD | relative standard deviation |
| RSL | regional screening level |
| SAS | Special Analytical Services |
| S/D | matrix spike and duplicate |
| SD | standard deviation |
| SDG | Sample Delivery Group |
| SHSO | Site Health and Safety Officer |
| SIM | selected ion monitoring |
| SOP | Standard Operating Procedure |
| SOW | Statement of Work |
| SRM | Standard Reference Material |
| SSL | soil screening level |
| START | Superfund Technical Assessment and Response Team |
| SVOC | semivolatile organic compound |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| TDD | Technical Direction Document |
| TM | Task Manager |
| TO | Task Order |
| TSA | Technical Systems Audit |
| UFP-QAPP | Uniform Federal Policy–Quality Assurance Project Plan |
| URL | Uniform Resource Locator |
| VOA | volatile organic analysis |
| VOC | volatile organic compound |
| VTSR | verified time of sample receipt |
| WESTON® | Weston Solutions, Inc. |

## TABLE 1 — Crosswalk: UFP-QAPP Workbook to 2106-G-05 QAPP

| Optimized UFP-QAPP Worksheets | | 2106-G-05 QAPP Guidance Section | |
|---|---|---|---|
| **A. Project Management and Objectives** | | | |
| 1 & 2 | Title and Approval Page | 2.2.1 | Title, Version, and Approval/Sign-Off |
| 3 & 5 | Project Organization and QAPP Distribution | 2.2.3 | Distribution List |
| | | 2.2.4 | Project Organization and Schedule |
| 4, 7, & 8 | Personnel Qualifications and Sign-Off Sheet | 2.2.1 | Title, Version, and Approval/Sign-Off |
| | | 2.2.7 | Special Training Requirements and Certifications |
| 6 | Communication Pathways | 2.2.4 | Project Organization and Schedule |
| 9 | Project Planning Session Summary | 2.2.5 | Project Background, Overview, and Intended Use of Data |
| 10 | Problem Definition | 2.2.5 | Project Background, Overview, and Intended Use of Data |
| 11 | Project/Data Quality Objectives | 2.2.6 | Data/Project Quality Objectives and Measurement Performance Criteria |
| 12 | Measurement Performance Criteria | 2.2.6 | Data/Project Quality Objectives and Measurement Performance Criteria |
| 13 | Secondary Data Uses and Limitations | Chapter 3 | QAPP ELEMENTS FOR EVALUATING EXISTING DATA |
| 14 & 16 | Project Tasks & Schedule | 2.2.4 | Project Organization and Schedule |
| 15 | Project Action Limits and Laboratory-Specific Detection/Quantitation Limits | 2.2.6 | Data/Project Quality Objectives and Measurement Performance Criteria |
| **B. Measurement/Data Acquisition** | | | |
| 17 | Sampling Design and Rationale | 2.3.1 | Sample Collection Procedure, Experimental Design, and Sampling Tasks |
| 18 | Sampling Locations and Methods | 2.3.1 | Sample Collection Procedure, Experimental Design, and Sampling Tasks |
| | | 2.3.2 | Sampling Procedures and Requirements |
| 19 & 30 | Sample Containers, Preservation, and Hold Times | 2.3.2 | Sampling Procedures and Requirements |
| 20 | Field Quality Control (QC) Sample Summary | 2.3.5 | QC Requirements |

## TABLE 1 — Crosswalk: UFP-QAPP Workbook to 2106-G-05 QAPP (Continued)

| Optimized UFP-QAPP Worksheets | | 2106-G-05 QAPP Guidance Section | |
|---|---|---|---|
| 21 | Field Standard Operating Procedures (SOPs) | 2.3.2 | Sampling Procedures and Requirements |
| 22 | Field Equipment Calibration, Maintenance, Testing, and Inspection | 2.3.6 | Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables |
| 23 | Analytical SOPs | 2.3.4 | Analytical Methods Requirements and Task Description |
| 24 | Analytical Instrument Calibration | 2.3.6 | Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables |
| 25 | Analytical Instrument and Equipment Maintenance, Testing, and Inspection | 2.3.6 | Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables |
| 26 & 27 | Sample Handling, Custody, and Disposal | 2.3.3 | Sample Handling, Custody Procedures, and Documentation |
| 28 | Analytical QC and Corrective Action | 2.3.5 | QC Requirements |
| 29 | Project Documents and Records | 2.2.8 | Document and Records Requirements |
| **C. Assessment/Oversight** | | | |
| 31, 32, & 33 | Assessments and Corrective Action | 2.4 | ASSESSMENTS AND DATA REVIEW (CHECK) |
| | | 2.5.5 | Reports to Management |
| **D. Data Review** | | | |
| 34 | Data Verification and Validation Inputs | 2.5.1 | Data Verification and Validation Targets and Methods |
| 35 | Data Verification Procedures | 2.5.1 | Data Verification and Validation Targets and Methods |
| 36 | Data Validation Procedures | 2.5.1 | Data Verification and Validation Targets and Methods |
| 37 | Data Usability Assessment | 2.5.2 | Quantitative and Qualitative Evaluations of Usability |
| | | 2.5.3 | Potential Limitations on Data Interpretation |
| | | 2.5.4 | Reconciliation with Project Requirements |

## Introduction

On 25 August 2017, Hurricane Harvey made first landfall in the United States on the south Texas coast, returned to the Gulf of Mexico on 29 August 2017 and then on made second landfall on 30 August 2017 on the southwestern coast of Louisiana. Hurricane Harvey caused massive damage and flooding to broad areas of Texas and Louisiana. The U.S. Environmental Protection Agency Region 6 intiated Hurricane Harvey Response activities to support State and Local official with on-going response actions. As part of Hurricane Harvey Response activities, environmental surface water samples will be collected to assess site conditions within flood water adjacent to the Arkema chemical plant in Crosby, Texas. The facility produces liquid organic peroxides that are primarily used in the production of plastic resins, polystyrene, polyethylene, polypropylene and acrylic resins. Some of the products are unstable and may self ignite when not stored at the appropriate temperature. As a result of Hurricane Harvey, the plant lost power and residents living with within a 1.5-mile radius of the facilty were evacuated due to the unsable nature of the chemicals at the facility. Without power or backup generators at the site, the organic peroxides stored inside nine containers warmed to dangerous levels and caught fire. As a result of the fires, there is concern that chemicals from the facility may have migrated off-site and into nearby floodwaters.

The Arkema, Inc. plant is located at 18000 Crosby Eastgate Road, Crosby, Texas.

The objective of this surface water sampling event is to document if chemicals from the facility are present in the surrounding floodwaters and determine if they pose an imminent threat or substantial danger to human health and the environment.

The purpose of this document is to describe the personnel; standard operating procedures (SOPs) for data collection, assessment, and storage; and other QA documentation for all tasks that could be expected to be completed for EPA Region 6 in support of Hurricane Harvey Response Activities associated with impacted areas along the Texas and Louisia Gulf Coast. It provides completed optimized UFP-QAPP worksheets prepared in accordance with U.S. EPA's *UFP-QAPPs, Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs, Part 1: UFP-QAPP Manual, EPA-505-B-04-900A, (March 2005); Part 2A: UFP-QAPP Workbook, Revision 1, (March 2012);* Section 6 (Part B) of *Quality Systems for Environmental Data and Technology Programs: Requirements with Guidance for Use*, American National Standards Institute (ANSI)/American Society for Quality (ASQ) E4 (ANSI/ASQ, 2004); *EPA Requirements for Quality Assurance Project Plans,* QA/R-5 (March 2001); and U.S. EPA's *CIO 2106-G-05 QAPP* (January 2012), which supersedes the update of QA/G5, *Guidance for Quality Assurance Project Plans* (December 2002). A crosswalk between this UFP-QAPP and the EPA requirements for QA documents is included in Table 1.

The specific requirements of the UFP-QAPP are identified in each of the worksheets. The EPA Region 6 QA Document Review Crosswalk will be the cross-reference between the QAPP and project-specific documents.

This document provides a process for obtaining data of sufficient quality and quantity to satisfy project needs associated with the Hurricane Harvey response. It identifies policy, organization,

functional activities, and data quality objectives (DQOs) and measures necessary to obtain adequate data for a given purpose. Additionally, it identifies the requirements to develop the rationale for selection of the proposed sampling locations, analyses, and specific procedures for collecting data on a site-specific basis during removal, assessment, and/or emergency response activities. Environmental samples will be collected for analytical analysis through an EPA contractor -subcontracted laboratory. The field work and data evaluation will be completed in accordance with this Site-Specific UFP-QAPP. Addendums to this document will be issued to address any new procedures required. UFP-QAPP review documentation, and revisions if necessary, will be submitted to EPA following management approval.

## Worksheet 1 & 2 — Title and Approval Page

(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

1. **Project Identifying Information**

   a) **Site Name/Project Name:** Hurricane Harvey Response Support
   b) **Site Location/Number:** EPA Region 6: Texas
   c) **Contract/Work Assignment Number:** EP-S5-17-02

2. **List Plans and reports from previous investigation relevant to this project.**
   Not applicable

***Lead Organization's Program Manager:***

Cecilia Shappee, P.E./WESTON
*Printed Name/Title*

*Signature/Date*

***Lead Organization's Quality Manager:***

Gretchen Fodor, CHMM/WESTON
*Printed Name/Title*

*Signature/Date*

***Lead Organization's Chemist:***

Jeff Wright, CHMM/WESTON
*Printed Name/Title*

*Signature/Date*

***Federal Regulatory Agency Contracting Officer:*** Brian Delaney/EPA
*Printed Name/Title*

*Signature/Date*

***Federal Regulatory Agency Project Officer:*** Will LaBombard /EPA
*Printed Name/Title*

*Signature/ Date*

***Federal Regulatory Agency Quality Manager:*** Walt Helmick/EPA

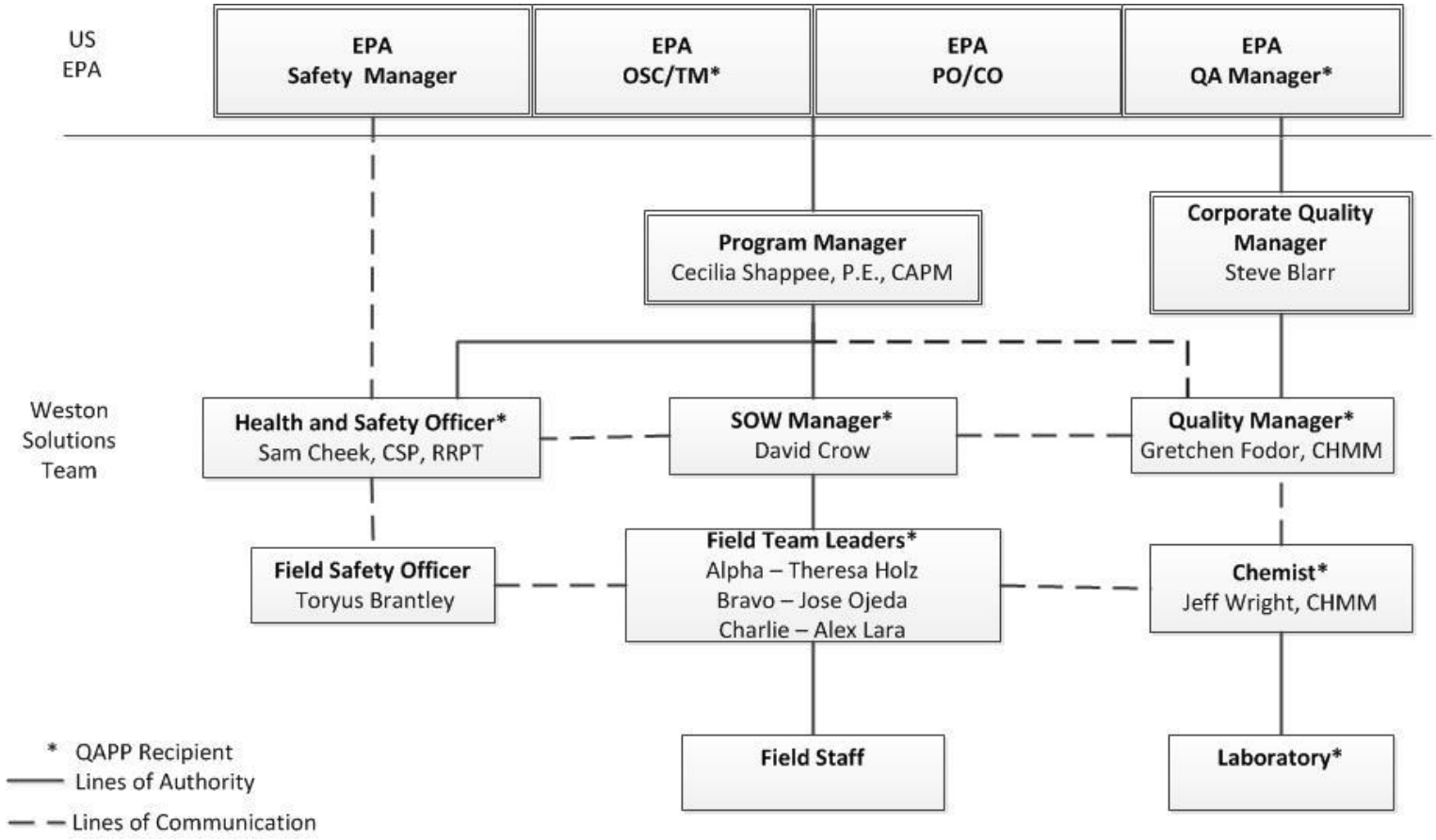
*Printed Name/Title*

*Signature/Date*

## Worksheet 3 & 5 — Project Organization and QAPP Distribution

(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

### Project Organization Chart



## Worksheet 3 & 5 — Project Organization and QAPP Distribution *(Continued)*

(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

| QAPP Recipients | Title | Organization | Telephone Number | E-Mail Address |
|---|---|---|---|---|
| Brian Delaney | Contracting Officer | EPA Region 6 | 214.665.7473 | Delaney.Brian@epa.gov |
| Will LaBombard | Project Officer | EPA Region 6 | 214.665.7199 | LaBombard.Will@epa.gov |
| Walt Helmick | Quality Assurance Manager | EPA Region 6 | 214.665.8373 | Helmick.Walt@epa.gov |
| Cecilia Shappee | Program Manager | WESTON | 713.985.6601 | c.shappee@westonsolutions.com |
| Gretchen Fodor | Quality Manager | WESTON | 703.724.0544 | gretchen.fodor@westonsolutions.com |
| Jeff Wright | Chemist | WESTON | 225.297.5415 | jeff.wright@westonsolutions.com |
| David Crow | WESTON SOW Manager | WESTON | 469.666.5500 | david.crow@westonsolutions.com |
| Sam Cheek | Health and Safety Officer | WESTON | 469.666.5585 | sam.cheek@ westonsolutions.com |
| Jeff Wright (or designee) | Data Validator(s) | WESTON | 225.297.5415 | jeff.wright@westonsolutions.com |

## Worksheet 4, 7 & 8 — Personnel Qualifications and Sign-off Sheet

(UFP-QAPP Manual Sections 2.3.2 - 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

| **Organization: WESTON** | | | | | |
|---|---|---|---|---|---|
| **Name** | **Project Title / Role** | **Education / Experience** | **Specialized Training / Certifications[1]** | **Training Provider[2]** | **Signature / Date** |
| Cecilia Shappee | Program Manager/Point of contact (POC) with EPA CO/PO. Oversees implementation and performance associated with the contract and has ultimate responsibility and authority to ensure all contractual requirements are met, including timeliness and management of budget. Ensures the quality of work performed. Provides overall management and support to the POC for the Contract, including cost, schedule, and technical quality. Assists in day-to-day management of project operations, deliverable completion, field investigations, quality control, and health and safety. Maintains communication and coordination with EPA for the duration of the project, including progress and detailed cost reporting. Oversees the management and coordination between WESTON staff, subcontractors, and EPA. | B.S. and Master in Civil Engineering / 24 years of EPA Region 6 program management experience as Program Manager and Deputy Program Manager, including 16 years of experience for START contracts and 8 years for the ARCS program. As Program Manager, have overseen 300+ TDDs and 19 Active Task Orders for START 3. As START Quality Officer and Deputy Program Manager, oversaw 809+ TDDs and 43 Task Orders. | Professional Engineer in the states of OK (#16565), TX (#61446) and KS (# 13805); Corrective Action Project Manager in TX (#CAPM01614); ICS 100 – 400, 700 & 800; Basic/4-Hour Radiation Training; 40-Hour Hazardous Waste Site Training, OSHA; 8-Hour Hazardous Waste Refresher, OSHA; 8-Hour Site Supervisor Training, OSHA; RCMS Training; Hazardous Waste Management and Shipping for Environmental Professionals; First Aid and CPR; Hazardous Categorization Field Testing; EPA HRS Training. | WESTON, Registered Training Organization – Various | |

## Worksheet 4, 7 & 8 — Personnel Qualifications and Sign-off Sheet *(Continued)*

(UFP-QAPP Manual Sections 2.3.2 - 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

| **Organization: WESTON** | | | | | |
|---|---|---|---|---|---|
| **Name** | **Project Title / Role** | **Education / Experience** | **Specialized Training / Certifications[1]** | **Training Provider[2]** | **Signature / Date** |
| Gretchen Fodor | Responsible for quality systems implementation and management, review and approval of quality documents, review and approval of contract deliverables, and performing quality assessments and quality system audits. Has direct and independent reporting requirements to the WESTON Chief Operating Officer on nonconformance, performance, and corrective action issues. Tracks the development and implementation of project-specific QAPPs, FSPs, and SOPs. Encourages continual improvement by implementing policies based on audit observations and issues identified by field personnel. | M.S., Environmental Studies, University of Massachusetts (1998); B.S., Chemistry, St. Lawrence University (1975)/ CHMM with 30 years of environmental chemistry quality experience on 500+ EPA TDDs in Regions 1, 3, and 6 providing data validation/QA support. | Certified Hazardous Materials Manager (#07662); Level A Trained; Basic/Advanced/4-Hour Refresher Radiation Training; 40-Hour/8-Hour Hazardous Waste Site Trainings, OSHA; 8-Hour Site Supervisor Training, OSHA; 8-Hour WMD Awareness Training; EPA HRS Training; SCRIBE; and Asbestos Inspector Training. | WESTON, Registered Training Organization – Various | |
| Jeff Wright | Chemist for quality systems implementation and management, review and approval of quality documents, review and approval of contract deliverables, and performing quality assessments and quality systems audits. Maintains authority over implementation of quality systems management. | B.S., Chemistry; B.S. Biology/ Over 25 years of environmental experience, including emergency response; planning and preparedness; removal assessments and actions; and remedial assessments, evaluations, and actions. | CLP Program Organic and Inorganic Data Validation Training; EPA Hazard Ranking System Training; Certified Hazardous Materials Manager; R6 QA Annual Training; 40-Hour OSHA Hazardous Waste Site Worker Training; 8-Hour OSHA Refresher Training; First Aid and CPR: FEMA ICS Levels 100, 200, 300, 700, and 800. | WESTON, EPA, Registered Training Organization – Various | |

## Worksheet 4, 7 & 8 — Personnel Qualifications and Sign-off Sheet *(Continued)*

(UFP-QAPP Manual Sections 2.3.2 - 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

| **Organization: WESTON** | | | | | |
|---|---|---|---|---|---|
| **Name** | **Project Title / Role** | **Education / Experience** | **Specialized Training / Certifications[1]** | **Training Provider[2]** | **Signature / Date** |
| David Crow | SOW Manager / Operational POC for project level communications with EPA OSCs/Task Managers (TMs), ensure performance associated with the contract, coordinate and communicate with EPA in the pre-planning phase of individual Technical Direction Document (TDD) assignments, provide technical direction to the Project Team Lead (PTL), and support any functions delegated by the Program Manager. | 10+ years of experience and Bachelor's degree in the fields conduct environmental response, assessment, removal, remediation and data support. | Typical Training/Certs = ICS Levels 100-400, 700 & 800; Radiation Training; 40-Hour OSHA & 8-Hour Hazardous Waste Refresher, OSHA; 8-Hour Site Supervisor Training, OSHA; HazCat Field Testing; 30-Hour Construction Safety and Health Training; Hazardous Waste Management and Shipping; SCRIBE; Advanced ArcMap Training; and ESRI | WESTON, EPA, Registered Training Organization – Various | |
| Toryus Brantley and Assigned Field Team | PTL / Supervises field sampling and coordinates all field activities. Ensures all training/certifications are satisfied for field team personnel. | Education and Experience on file with Weston Solutions, Inc. | 40-Hour OSHA Hazardous Waste Site Worker Training; 8-Hour OSHA Refresher Training; First Aid and CPR; FEMA ICS Levels 100, 200, 700, and 800 at minimum. | WESTON, Registered Training Organization – Various | N/A |

[1] Training records and/or certificates are on file at the Weston Solutions, Inc., office and are available upon request.

[2] Training provider and date of training will vary from person to person due to individual scheduling of training.

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## Worksheet 6 — Communication Pathways

(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

| Communication Drivers | Organization/Title | Name | Contact Information | Procedures (Timing, Pathways, Documentation, etc.) |
|---|---|---|---|---|
| Regulatory Agency Interface | EPA CO/PO/QA Manager | Will LaBombard | 214.665.7199 | Maintain lines of communication between EPA CO and WESTON Program Manager. |
| Approves Site-Specific QA Documents | EPA OSC/TM | Walt Helmick | 225.297.5415 | Approves Project QAPP in accordance with EPA guidance documents and policy. Provides guidance or instruction for site-specific QA documents. |
| POC with EPA OSC/TM/PO/QA Manager | WESTON Program Manager | Cecilia H. Shappee | 713.985.6601 | Maintain lines of communication between EPA OSC/TM , PO, and WESTON SOW and Quality Managers. |
| Manage all Project Phases | WESTON SOW Manager and PTLs | See Worksheet 3 & 5 | See Worksheet 3 & 5 | Manage day to day operations of the project. Reports to Program Manager and EPA OSC/TM issues with cost, schedule, etc. |
| Health and Safety Monitoring/Reporting | WESTON Health and Safety Manager | Sam Cheek | 469.666.5585 | Communicates with PTL and SOW Manager regarding safety issues, stop work, and reporting on a daily basis, when required. |
| Project UFP-QAPP Amendments | WESTON Quality Manager | Gretchen Fodor | 703.724.0544 | Major changes to the EPA Hurricane Harvey Arkema Surface Water Sampling UFP-QAPP must be approved by the Quality Manager before implementation. |
| Changes to Project QAPP Prior to Field Work | WESTON Quality Manager | Gretchen Fodor | 703.724.0544 | WESTON Quality Manager and SOW Manager communicates changes to site-specific Project QAPP to WESTON PTL and, as needed, to the WESTON Chemist and EPA OSC/TM. Communicates with PTL to determine need for field corrective actions. |
| Changes made Project QAPP in the Field and Daily Field Progress Reports | WESTON PTL | Michelle Brown | 469-666-5527 | Communicate QAPP changes and changes in field activities to WESTON Chemist, EPA OSC/TM and SOW Manager on a daily basis, when required. If corrective actions are necessary, the PTL will communicate the |

## Worksheet 6 — Communication Pathways

(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

| | | | | |
|---|---|---|---|---|
| | | | | QAPP changes to the WESTON Quality Manager. |
| Lab Data Quality Issues (including sample receipt variances and laboratory quality control variances) | Laboratory Project Manager (PM) | Ana Spencer(Eurofins)<br>Ruth Welsh (Pace Energy) | | Laboratory PM will report any issues with project samples to the WESTON Chemist within 1 business day of notification. The WESTON Chemist will contact the field sampler if necessary to resolve sample receiving discrepancies. |
| Data verification and data validation issues | WESTON Data Validator | Jeff Wright | 225.297.5415 | The WESTON Data Validator will contact the subcontract laboratory in writing to resolve data package errors and missing data elements. The WESTON Data Validator will review the data package for conformance to the analytical method and analytical technical specifications. |
| Analytical Corrective Actions | WESTON Chemist/Data Validator<br>Laboratory PM | Jeff Wright<br>Ana Spencer(Eurofins)<br>Ruth Welsh (Pace Energy | 225.297.5415 | The need for analytical corrective actions will be determined (1) by the WESTON Chemist upon notification by the Laboratory PM of quality problems encountered or (2) during WESTON's review of the data by either the WESTON Chemist or WESTON data validator. Deficiencies identified by the WESTON data validator will be communicated in writing to the WESTON Chemist for action by the laboratory.<br>If laboratory corrective actions are necessary, the WESTON Chemist will communicate with the WESTON Quality Manager. |
| Data Tracking and Management, Release of Analytical Data | WESTON Chemist<br>WESTON SOW Data Manager | Jeff Wright<br>David Crow | 225.297.5415<br>469.666.5500 | The need for corrective actions will be determined by the Chemist upon review of the data. No analytical data will be released prior to validation and all releases must be approved by the Chemist, Quality Manager and EPA OSC/TM. |

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## Worksheet 9 — Project Planning Session Summary

(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Project Planning and Scoping meetings will be coordinated at or from the EPA Region 6 Regional Emergency Operations Center (REOC) with the input of EPA and EPA contractor personnel. The meetings and correspondence will define the purpose and environmental decisions to be made, and the project quality objectives needed to achieve the expected results.

**Site Name/Project Name**: Hurricane Harvey Response Action – Water Sampling
**Site Location**: R6 Dallas REOC planning for Arkema Surface Water Sampling

**Date of Session(s):** August 29 and 31, 2017, September 1, 2017
**Scoping Session Purpose:**

| Name | Title | Affiliation | Phone # | E-mail Address | *Project Role |
|---|---|---|---|---|---|
| Jon Rauscher | EU Leader | EPA R6 | - | Rauscher.Jon@epa.gov | Environmental Unit Leader |
| Philip Turner | EU Co-lead | EPA R6 | - | Turner.Philip@epa.gov | Environmental Unit Leader |
| Larisa Leonova | EU | EPA | - | leonova.larisa@epa.gov | |
| Eric Dlegado | EPA OSC | EPA R6 | - | Delgado.eric@eps.gov | |
| Michelle Brown | EU liaison | Weston | - | michelle.brown@westonsolutions.com | |
| Jeff Wright | Project Chemist | Weston | 225-297-5415 | Jeff.Wright@westonsolutions.com | Project Chemist |

**Comments/Decisions:**

- Water Sampling - Which list of analytes and what analyses will be used for water sampling at Arkema? List compiled of Volatile Organic Compounds (VOCs), Semivolatile Organic Compounds (SVOCs), metals/mercury (Hg), Organochlorine (OC) Pesticides, Herbicides, Polychlorinated biphenyls (PCBs). Lists derived from CLP SOM02.4 and ISM 02.4
- What level of deliverable will be required and type of validation that will occur?
- What compounds are specific to Arkema facility?
- What will be the action levels and DQOs?

**Consensus Decisions:**

- Will base analyses on the facility specific chemicals. Need to receive the SDSs from the facility of their chemicals, then research what analytical methods available.
- The RMLs will be used for screening as well as a determination of present/not present for analytes, to determine if release has occurred and next step.

## Worksheet 9 — Project Planning Session Summary

(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

- Level 2 deliverables at 24 hour turnaround time, with a Stage 2A data validation.
- See comments below. It was decided to run standard VOCs and SVOCs analyses to compare against RMLs, and the specialty analyses as a present/not present test, that did not require standard validation.

**Notes/Comments:** The facility specific chemicals are not part of a standard analytical methodology. They are part of the VOC and SVOC groups, but the chemicals are manufactured in China and not readily available as standards for calibration or validation. After contacting laboratories and through research, it was discovered that Naphtha could be analyzed by a specialty method. It was also found that the breakdown products of the organic peroxides could be discerned by an experienced chemist from the ion spectra eluting from a semivolatile analysis.

**Action Items:**

| Action | Responsible Party | Due Date |
|---|---|---|
| Obtain the facility SDSs and research analytical methods | Weston | 8/31-9/1 |
| Confirm list of analytes and analytical procedures | EU | 8/31-9/1 |
| Input RMLs into approved analyte list for VOCs and SVOCs and ensure lab meets required limits. | Weston | 8/31-9/1 |

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## Worksheet 10 — Problem Definition

(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

- Introduction and Project Objectives

  The objective of this surface water sampling event is to document if chemicals from the facility are present in the surrounding floodwaters and determine if they pose an imminent threat or substantial danger to human health and the environment. The contantaminates of concern at the facility included VOCs, SVOCs and the following specialty compounds:

  - Neodecaneperoxoic acid, 1,1- dimethylpropyl ester (CAS No. 68299-16-1)
  - Naphtha (petroleum), heavy alkylate (CAS No. 64741-65-7)
  - Naphtha (petroleum), hydrotreated heavy (CAS No. 64742-48-9)
  - Hydroperoxide, 1,1-dimethylpropyl (CAS No. 3425-61-4)
  - Peroxydicarbonic acid, dipropyl ester (CAS No. 16066-38-9)
  - Neodecaneperoxoic acid, 1-methyl-1- phenylethyl ester (CAS No. 26748-47-0)
  - Propaneperoxoic acid, 2,2-dimethylehtyl ester, 1,1-dimethylethyl ester (CAS No. 927-07-1)
  - Peroxide, bis(1,1-dimethylpropyl) (CAS No. 10508-09-5)

- Health and Safety Plan Implementation;

  Health and Safety operations will be conducted consistent with activities and responsibilities of the Incident Command System (ICS). All field activities will be conducted in accordance with the Arkema health and safety plan (HASP). The Field Safety Officer (FSO) will be responsible for implementation of the HASP during all field investigation activities. All EPA contractors and subcontractors will be required to conduct their activities according to the guidelines and requirements of the HASP.

- Sampling and Sample Handling Procedures;

  Five Surface Water samples will be collected using equipment and procedures appropriate for surface water and the associated parameters. The volume of the sample collected must be sufficient to perform the laboratory analysis requested. Samples must be stored in the proper types of containers and preserved in a manner appropriate to the analysis to be performed. Samples will be collected with laboratory provided, clean unpresevered amber jars and poured into their respective pre-cleaned, unused glass or plastic containers as appropriate based on the particular analytical method (Worksheet 19&30). Sampling personnel will change gloves and use a dedicated amber jar between each sample collection point. All samples will be assembled and catalogued prior to shipping to the designated laboratory. Sampling and Sample Handling SOPs are provided by reference in Worksheet 22. The EPA contractor personnel will prepare and complete Chain-of-Custoday forms using the SCRIBE environmental sampling data management system. During the project and at its completion, the Data Manager will publish the SCRIBE file to SCRIBE.net to establish a permanent record of the samples collected and the data resulting in the analysis of those samples.

## Worksheet 10 — Problem Definition

(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

- Analytical Approach;

  Samples collected by EPA during this sampling task will be delivered to the EPA portable high-throughput integrated laboratory indentificantion system (PHILIS) mobile laboratory for Volatile Organic Compounds (VOCs) by Method 8260C and Semivolatile Organic Compounds (SVOCs) by Method 8270D, utilizing EPA publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. Samples will also be submitted to Eurofins Lancaster Laboratory for Tentiatively Indentified Compound (TICs) spectra analysis also utilizing EPA Methods 8260C and 8270D. Samples will also be submitted to Pace Analytical Energy Lab for PIANO [n-Paraffins (P), Iso-paraffins (I), Aromatics (A), Naphthenes (N) and Olefins (O)] gasoline range fingerprinting (C3-C12 Quantitative Molecular Characterization) specialty analysis by GC/MS and Full Scan C8-C40 Qualitative Molecular Characterization specialty analysis by GC/MS. In determining the nature and extent of potential contamination, analytical results of the standard VOCs and SVOCs analyses will be compared the Regional Removal Management Levels for Chemicals (RMLs), Residential Tap Water (https://www.epa.gov/risk/regional-removal-management-levels-chemicals-rmls). Non-routine analyses (VOC-TICs, SVOCc-TICs) will be reviewed for presence or absence of the eight specialty chemicals listed above. GC/MS TIC spectra will be reviewed to determine if they relate to the specta of the eight specialty chemicals. PIANO Specialty Analysis and Full Scan C3-C12 Quantitative Molecular Characterization and C8-C40 Qualitative Molecular Characterization Specialty Analysis by GC/MS will be reviewed for presence or absence (Qualitative) of Naptha which will be reported as a relative percent of Napthenic material.

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## Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

The Site-specific Data Quality Objectives (DQOs) were developed using the EPA seven-step DQO process. The seven step process is described in the guidance for Worksheet #11 in the Optimized UFP-QAPP Worksheets (IDQTF, March 2012). Project/Data Qualtiy Objective for the Arkema, Inc. Surface Water Sampling Event includes the following:

| **STEP 1. STATE THE PROBLEM** | |
|---|---|
| Water samples will be collected from areas the contact run-off water from the facility combined with flood waters from Hurricane Harvey. Samples will be collected downstream to screen for the presence of hazardous waste (potential contaminants of concern) that could present an unacceptable risk to human health and the environment. | |
| **STEP 2. IDENTIFY THE DECISION** | |
| Are there potential chemicals of concern in water, represented by a sample, based on comparison to residential screening benchmarks? | |
| IDENTIFY THE ALTERNATIVE ACTIONS THAT MAY BE TAKEN BASED ON THE DECISIONS. | •If sample results exihibit contaminant concentrations that exceed the assoiciated EPA RML value for Residential Tapwater, or the specialty chemical is present, the water will need further characterization/assessment.<br>•If sample results do not exihibit contaminant concentrations that exceed the associated EPA RML value for Residential Tapwater or specialty chemical is not present in water samples, no further screening will be necessary for contaminants being analyzed. |
| **STEP 3. IDENTIFY INPUTS TO THE DECISION** | |
| IDENTIFY THE INFORMATIONAL INPUTS NEEDED TO RESOLVE A DECISION. | Contaminant concentrations in water samples collected from where facility run-off have combined with Hurricane Harvey flood waters. |
| IDENTIFY THE SOURCES FOR EACH INFORMATIONAL INPUT AND LIST THE INPUTS THAT ARE OBTAINED THROUGH ENVIRONMENTAL MEASUREMENTS. | •Water samples from where facility run-off have combined with Hurricane Harvey flood waters.<br>•Analytical results from VOC, SVOC, VOC TICs spectra, SVOC TICs spectra, PIANO (C3-C12 Quantitative Molecular Characterization) and Full Scan C8-C40 Qualitative Molecular Characterization. |
| BASIS FOR THE CONTAMINANT SPECIFIC ACTION LEVELS. | For water, RMLs (VOCs and SVOCs) and present/not present determination for TICs, PIANO and Full Scan C8-C40 specialty analyses. |

## Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

| | |
|---|---|
| IDENTIFY POTENTIAL SAMPLING TECHNIQUES AND APPROPRIATE ANALYTICAL METHODS. | •Grab samples of water.<br>•Locations to be determined in the field.<br>• See Worksheet 17 |
| **STEP 4. DEFINE THE BOUNDARIES OF THE STUDY** | |
| DEFINE THE DOMAIN OR GEOGRAPHIC AREA WITHIN WHICH ALL DECISIONS MUST APPLY. | Locations where facility run-off have combined with Hurricane Harvey flood waters. |
| SPECIFY THE CHARACTERISTICS THAT DEFINE THE POPULATION OF INTEREST. | Contaminant concentrations in water at the sample locations. |
| DEFINE THE SCALE OF DECISION MAKING. | The scale of decision will be for the site activities occurring at the time of the sample collection. |
| DETERMINE THE TIME FRAME TO WHICH THE DATA APPLY. | The analytical data will apply until such a time as additional sampling activities are conducted and/or response actions taken. |
| DETERMINE WHEN TO COLLECT DATA. | Samples will be collected during the field sampling activities. |
| IDENTIFY PRACTICAL CONSTRAINTS ON DATA COLLECTION. | Access<br>Inclement weather. |
| **STEP 5. DEVELOP A DECISION RULE** | |
| SPECIFY THE PARAMETER THAT CHARACTERIZES THE POPULATION OF INTEREST. | The concentrations of chemicals identified in water samples. |
| SPECIFY THE ACTION LEVEL FOR THE DECISION. | For water, Regional Removal Management Levels (RMLs), Residential Tapwater values for VOCs and SVOCs and a present/not present determination for the specialty chemicals. |
| DEVELOP A DECISION RULE. | If any result in a water sample is above the contaminant specific screening level, then further characterization may be necessary (which would be addressed by a QAPP for a future phase). |
| **STEP 6. SPECIFY LIMITS ON DECISION ERRORS** | |
| DETERMINE THE POSSIBLE RANGE OF THE PARAMETER OF INTEREST. | Contaminant concentrations may range from non–detect to above the screening values for water. |

## Worksheet 11 — Project/Data Quality Objectives

(UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

| | |
|---|---|
| DEFINE BOTH TYPES OF DECISION ERRORS AND IDENTIFY THE POTENTIAL CONSEQUENCES OF EACH. | Type I Error: Deciding that the specified area represented by the water sample does not exceed the specified screening level when, in truth, the water concentration of the contaminant exceeds its screening level. The consequence of this decision error is that contaminated water exists, possibly endangering human health and the environment. This decision error is more severe. |
| DEFINE BOTH TYPES OF DECISION ERRORS AND IDENTIFY THE POTENTIAL CONSEQUENCES OF EACH. | Type II Error: Deciding that the specified area represented by the water sample does exceed screening level when, in truth, it does not. The consequence of this decision error is that further characterization would take place, thereby, delaying the time when residents may return. |
| ESTABLISH THE TRUE STATE OF NATURE FOR EACH DECISION RULE. | The true state of nature when the water is decided to be below the screening levels when in fact, they are not below the screening levels, is that further characterization may be necessary. The true state of nature when the water is decided to be above the screening levels when in fact, they are not above the specified action levels, is that further characterization may not be necessary. |
| DEFINE THE TRUE STATE OF NATURE FOR THE MORE SEVERE DECISION ERROR AS THE BASELINE CONDITION OR THE NULL HYPOTHESIS ($H_o$) AND DEFINE THE TRUE STATE FOR THE LESS SEVERE DECISION ERROR AS THE ALTERNATIVE HYPOTHESIS ($H_a$). | $H_o$: The water represented by the sample are above the screening level.<br>$H_a$: The water represented by the sample are below the screening level. |
| ASSIGN THE TERMS "FALSE POSITIVE" AND "FALSE NEGATIVE" TO THE PROPER DECISION ERRORS. | •False Positive Error = Type I<br>•False Negative Error = Type II |
| ASSIGN PROBABILITY VALUES TO POINTS ABOVE AND BELOW THE ACTION LEVEL THAT REFLECT THE ACCEPTABLE PROBABILITY FOR THE OCCURRENCES OF DECISION ERRORS. | The assignment of probability values is not applicable to this DQO because these samples are being collected for baseline and screening purposes. |
| **STEP 7. OPTIMIZE THE DESIGN** | |
| REVIEW THE DQOs. | Review results of this screening level sampling event(s) to determine if modification of this DQO is necessary and/or determine what other steps may be necessary. |

## Worksheet 12 — Measurement Performance Criteria Tables

(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

The analytical methods presented in the Worksheet 12 measurement performance criteria (MPC) tables include the analytical methods that have been requested to support the Arkema, Inc. Surface Water Sampling Event.

**Analytical Method Categories and Method Selection**

Analytical methods were developed by EPA and other related organizations for specific programs or analytical needs; analyses from any of these method categories may be requested based on Site-Specfic conditions and DQOs. PIANO [n-Paraffins (P), Iso-paraffins (I), Aromatics (A), Naphthenes (N) and Olefins (O)] gasoline range fingerprinting (C3-C12 Quantitative Molecular Characterization) analysis by GC/MS and Full Scan C8-C40 Qualitative Molecular Characterization Analysis by GC/MS.

| Parameter | Method Number (SW-846) or Lab SOP Method |
|---|---|
| VOCs (including TICs) | EPA 8260C |
| SVOCs (including TICs) | EPA 8270D |
| PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) | S-PAE-PF-007 C3-C12 Gasoline Range Fingerprinting by GC/MS P/T (Modified EPA 8260C) Rev00 |
| Full Scan C8-C40 Qualitative Molecular Characterization | S-PAE-PF-001, GC/MS Full Scan Analysis. Rev00, 1/13/2016 |

Worksheet 12 MPC table are provided for VOCs (8260C) and SVOCs (8270D) analysis conducted by the EPA PHILIS mobile laboratory (Table 12.1) as well as the PIANO C3-C12 Quantitative Characterization analysis (Table 12.2). MPC tables are not applicable for compound specific TIC spectra comparison and specialty Full Scan C8-C40 Qualitative Characterization.

## Worksheet #12.1: Measurement Performance Criteria for Volatile Organic Compounds (VOCs) and Semivolatile Organic Compounds (SVOCs) by GC/MS

**Matrix:** Water
**Analytical Group/Method:** VOCs and SVOCs /EPA 8260C and 8270D
**Concentration Level:** Low/Medium

| | |
|---|---|
| **Matrix** | Water |
| **Analytical Group** | VOCs and SVOCs |
| **Concentration Level** | Low/Medium/High |

| | Analytical Method/SOP[1] | Data Quality Indicators (DQIs) | Measurement Performance Criteria | QC Sample and/or Activity Used to Assess Measurement Performance | QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A) |
|---|---|---|---|---|---|
| | SW846, Method 8260C<br>SOP L-A-101 Rev 7<br><br>SW846, Method 8270D<br>SOP L-A-201 Rev 7 | Precision<br><br>Accuracy | % RPD <30<br><br>Average Recovery 50-140%<br>Acceptance criteria in LIMS | LCS | A |
| | | Accuracy | Factor of two (-50% to + 100%) from the initial/continuing calibration | Internal standards | A |
| | | Accuracy<br><br>Precision | Compound Specific average range: 50 - 140%<br>% RPD < 30 | Matrix spike/Matrix Spike Duplicate<br><br>RPD | A |
| | | Accuracy | Limits 30%-140%(Aqueous);<br><br>Acceptance criteria in LIMS | Surrogate Compounds | A |
| | | Precision | % RPD < 30 (water) | Field Duplicate | A |
| | | Accuracy | < RL | Method Blank | A |

[1] Reference number from QAPP Worksheet #23 and #28

## Worksheet #12.2: Measurement Performance Criteria for PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) by GC/MS

**Matrix:** Water
**Analytical Group/Method:** C3-C12 PIANO
**Concentration Level:** Low/Medium

| | |
|---|---|
| Matrix | Water |
| Analytical Group [1] | C3-C12 PIANO |
| Concentration Level | Low/Medium |

| | Analytical Method/SOP [1] | Data Quality Indicators (DQIs) | Measurement Performance Criteria | QC Sample and/or Activity Used to Assess Measurement Performance | QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A) |
|---|---|---|---|---|---|
| | S-PAE-PF-007, Rev00 | Precision | ± 15 | LCS/LCSD | A |
| | | Accuracy | 50-140 | LCS | A |
| | | Accuracy | No Analyte > RL | Lab Blank | A |

[1] Reference number from QAPP Worksheet #23 and #28

## Worksheet 13 — Secondary Data Uses and Limitations

(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements for Evaluating Existing Data)

No Secondary Data sources are anticipated to be used for this samping sampling event. If any data needed for this project implementation or decision making that are obtained from non-direct measurement sources such as computer databases, background information, technologies and methods, environmental indicator data, publications, photographs, topographical maps, literature files and historical data bases will be compared to the DQOs for the project to determine the acceptability of the data.

| **Data Type** | **Data Source** (originating organization, report title and date) | **Data Uses Relative to Current Project** | **Factors Affecting the Reliability of Data and Limitations on Data Use** |
|---|---|---|---|
| NA | NA | NA | NA |

## Worksheet 14 & 16 —Project Tasks Summary

(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

**Sampling Tasks**:

Water samples will be collected to assess site conditions in surface water adjacent to the Arkema, Inc. Chemical Plant in Crosby, Texas. The primary concern being addressed is to screen for the presence of chemicals of concern that may have been released from the facility into adjacent flood waters. Surface Water samples will be collected from from five locations near the facility as directed by EPA. Samples will be collected from each using standard field protocol as described in Worksheets 10 and 17.

**Analysis Tasks**:

VOCs (including TICs) – Water – EPA SW846 Method 8260C
SVOCs (including TICs) – Water – EPA SW846 Method 8270D
PIANO [n-Paraffins (P), Iso-paraffins (I), Aromatics (A), Naphthenes (N) and Olefins (O)]
Gasoline Range Fingerprinting (C3-C12 Quantitative Molecular Characterization) Analysis by GC/MS
Full Scan C8-C40 Qualitative Molecular Characterization Analysis by GC/MS.

**Quality Control Tasks:**

QA/QC samples will include the collection of one co-located water sample at the ratio of 1 per 20 samples and one trip blank per day for VOCs.

**Data Management Tasks:**

Activities under this project will be reported in status and reports and other deliverables (*e.g.,* analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports.

The following deliverables will be provided under this project:
Analytical Database:
Data Summary Tables: Will be provided to EPA as requested and upon receipt of EDD from Laboratory.
Environmental Sampling Data Management System: Upon receipt of the Laboratory EDD, the data will be uploaded into the project SCRIBE file. During the project and at its completion, the Data Manager will publish the SCRIBE file to SCRIBE.net to establish a permanent record of the samples collected and the data resulting in the analysis of those samples. All project data will be managed in accordance with the U.S. EPA Region 6, Data Management Plan, Version 1.0, August, 2017.

Data Validation Report: Will be completed with 48 hours of receipt of final data deliverable from the PHILIS Laboratory. Data Validation Report will be included in final report deliverable to EPA. TICs spectra, PIANO and Full Scan C3-C12 and C8-C40 Characterization are Qualitative in nature and will not require a Data Validation Report.
Final Report: Will becompleted and submitted to the EPA at a completion time to be determined.
Maps/Figures: Maps depicting site layout and sample locations will be included in the final report, as appropriate.

**Documentation and Records:**

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Field Logbook: The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. Field logbook will be bound and paginated. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following:

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions
6. Weather conditions
7. Site observations
8. Sample and sample location identification and description*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with COC information
11. Record of photographs
12. Site sketches
13. GPS Coordinates for each sample location

* The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date. The Field Logbook SOP (#1501.01) is referenced in Worksheet 22.1.

Sample Labels: Sample labels will clearly identify the particular sample, and should include the following:

1. Site/project number.
2. Sample identification number.
3. Sample collection date and time.
4. Designation of sample (grab or composite).
5. Sample preservation.

6. Analytical parameters.
7. Name of sampler.

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

Custody Seals: Custody seals demonstrate that a sample container has not been tampered with or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook. Sampling and sample custody SOPs (#0110.014, 1101.01) are referreced in Worksheet 21.1

**Assessment/Audit Tasks:** No performance audit of field operations is anticipated at this time. If conducted, performance and system audit will be in accordance with the project plan.

**Data Review Tasks:** Data from the EPA PHILIS mobile laboratory will be validated by EPA Region 6 subcontractor data validation personnel. Data Validation will consist of a Stage 2A validation review unless otherwise specified by EPA. Verify that the data validation report consists of the following for all field samples submitted to the laboratory: Data validation report (pdf) and Excel EDD file with the final data validation qualifiers will be provided as deliverables.

Definitive data projects: Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity Project validation criteria as per QAPP Worksheets 12, 15, 19 & 30, and 28 and cited EPA SW-846 methodology will be used. As directed by EPA, laboratory data packages will be verified and validated using a Stage 2A validation, as described in the EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009). Validation qualifiers will be applied using the following hierarchy: *EPA National Functional Guidelines for Organic Data Review*and analytical methods from EPA Publication SW-846; and the laboratory-specific SOP.

## Worksheet 15 — Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

(UFP-QAPP Manual Sections 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

The following information is provided for the Arkema Inc. Surface Water Sampling Event associated with the EPA PHILIS mobile laboratory Worksheet 15 Project Action Limits and Laboratory-Specific Detection/quantation Limits are not applicable for TIC spectra comparison and Full Scan C8-C40 Characterization and Qualitative analyses. This document will be updated as additional sampling parameters, event and/or laboratories are added to this project.

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## Worksheet #15.1: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) VOCs by EPA 8260C (Soil) – EPA PHILIS Lab

**Matrix:** Soil and Water
**Analytical Group:** Compound List Volatile Organic Compounds
**Concentration Level:** Low Level

| Analyte | CAS Number | Project Action Limits* | Project Quantitation Limit | Method 8260C Soil Low Quantitation Level mg/kg | Method 8260C Water Low Quantitation Level mg/L |
|---|---|---|---|---|---|
| Dichlorodifluoromethane | 75-71-8 | EPA Removal Management Levels (RMLs) See Appendix A | NS | 0.005 | 0.002 |
| Chloromethane | 74-87-3 | | NS | 0.005 | 0.002 |
| Vinyl Chloride | 75-01-4 | | NS | 0.005 | 0.002 |
| Bromomethane | 74-83-9 | | NS | 0.010 | 0.002 |
| Chloroethane | 75-00-3 | | NS | 0.005 | 0.002 |
| Trichlorofluoromethane | 75-69-4 | | NS | 0.005 | 0.002 |
| Acetone | 67-64-1 | | NS | 0.025 | 0.010 |
| 1,1-Dichloroethene | 75-35-4 | | NS | 0.005 | 0.002 |
| t-Butyl alcohol | 75-65-0 | | NS | 0.025 | 0.010 |
| Methylene chloride | 75-09-2 | | NS | 0.010 | 0.004 |
| Methyl tert-butyl ether | 1634-04-4 | | NS | 0.005 | 0.002 |
| trans-1,2-Dichloroethene | 156-60-5 | | NS | 0.005 | 0.002 |
| Diisopropyl ether | 108-20-3 | | NS | 0.005 | 0.002 |
| 2-Butanone | 78-93-3 | | NS | 0.025 | 0.010 |
| Ethyl tert-butyl ether | 637-92-3 | | NS | 0.005 | 0.002 |
| 1,1-Dichloroethane | 75-34-3 | | NS | 0.005 | 0.002 |
| cis-1,2-Dichloroethene | 156-59-2 | | NS | 0.005 | 0.002 |
| 2,2-Dichloropropane | 594-20-7 | | NS | 0.005 | 0.002 |
| Bromochloromethane | 74-97-5 | | NS | 0.005 | 0.002 |
| Chloroform | 67-66-3 | | NS | 0.005 | 0.002 |
| 1,1,1-Trichloroethane | 71-55-6 | | NS | 0.005 | 0.002 |
| 1,1-Dichloropropene | 563-58-6 | | NS | 0.005 | 0.002 |
| Carbon tetrachloride | 56-23-5 | | NS | 0.005 | 0.002 |
| tert-Amyl methyl ether | 994-05-8 | | NS | 0.005 | 0.002 |
| Benzene | 71-43-2 | | NS | 0.005 | 0.002 |
| Trichloroethene | 79-01-6 | | NS | 0.005 | 0.002 |
| 1,2-Dichloropropane | 78-87-5 | | NS | 0.005 | 0.002 |
| Dibromomethane | 74-95-3 | | NS | 0.005 | 0.002 |

## Worksheet #15.1: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) VOCs by EPA 8260C (Soil) – EPA PHILIS Lab *(Continued)*

**Matrix:** Soil and Water
**Analytical Group:** 8260C Volatile List Organic Compounds
**Concentration Level:** Low Levels

| Analyte | CAS Number | Project Action Limits* | Project Quantitation Limit (mg/kg) | Analytical Method 8260C (Low) Quantitation Limits (mg/kg) | Analytical Method – 8260C (Medium) Quantitation Limits (mg/L) |
|---|---|---|---|---|---|
| Bromodichloromethane | 75-27-4 | | NS | 0.005 | 0.002 |
| 4-Methyl-2-Pentanone | 108-10-1 | EPA Removal Management Levels (RMLs) See Appendix A | NS | 0.025 | 0.010 |
| cis-1,3-Dichloropropene | 10061-01-5 | | NS | 0.005 | 0.002 |
| Toluene | 108-88-3 | | NS | 0.005 | 0.002 |
| trans-1,3-Dichloropropene | 10061-02-6 | | NS | 0.01 | 0.002 |
| 1,1,2-Trichloroethane | 79-00-5 | | NS | 0.005 | 0.002 |
| 2-Hexanone | 591-78-6 | | NS | 0.025 | 0.010 |
| 1,3-Dichloropropane | 142-28-9 | | NS | 0.005 | 0.002 |
| Tetrachloroethene | 127-18-4 | | NS | 0.005 | 0.002 |
| Dibromochloromethane | 124-48-1 | | NS | 0.005 | 0.002 |
| 1,2-Dibromoethane | 106-93-4 | | NS | 0.005 | 0.002 |
| Chlorobenzene | 108-90-7 | | NS | 0.005 | 0.002 |
| 1,1,1,2-Tetrachloroethane | 630-20-6 | | NS | 0.005 | 0.002 |
| Ethyl benzene | 100-41-4 | | NS | 0.005 | 0.002 |
| m,p-Xylenes | 108-38-3 | | NS | 0.010 | 0.004 |
| o-Xylene | 95-47-6 | | NS | 0.005 | 0.002 |
| Xylenes, Total | | | NS | 0.015 | 0.006 |
| Styrene | 100-42-5 | | NS | 0.005 | 0.002 |
| Bromoform | 75-25-2 | | NS | 0.005 | 0.002 |
| Isopropylbenzene | 98-82-8 | | NS | 0.005 | 0.002 |
| 1,1,2,2-Tetrachloroethane | 96-18-4 | " | NS | 0.005 | 0.002 |
| 1,2,3-Trichloropropane | 96-18-4 | " | NS | 0.005 | 0.002 |
| Bromobenzene | 108-86-1 | " | NS | 0.005 | 0.002 |
| n-Propylbenzene | 103-65-1 | " | NS | 0.005 | 0.002 |
| 2-Chlorotoluene | 106-43-4 | " | NS | 0.005 | 0.002 |
| 1,3,5-Trimethylbenzene | 108-67-8 | " | NS | 0.005 | 0.002 |
| 4-Chlorotoluene | 106-43-4 | " | NS | 0.005 | 0.002 |

## Worksheet #15.1: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) VOCs by EPA 8260C (Soil) – EPA PHILIS Lab *(Continued)*

| Analyte | CAS Number | Project Action Limits* | Project Quantitation Limit (mg/kg) | Analytical Method 8260C (Low) Quantitation Limits (mg/kg) | Analytical Method – 8260C (Medium) Quantitation Limits (mg/L) |
|---|---|---|---|---|---|
| tert-Butylbenzene | 98-06-6 | EPA Removal Management Levels (RMLs) See Attachment A | NS | 0.005 | 0.002 |
| 1,2,4-Trimethylbenzene | 95-63-6 | " | NS | 0.005 | 0.002 |
| sec-Butylbenzene | 135-98-8 | " | NS | 0.005 | 0.002 |
| p-Isopropyltoluene | 99-87-6 | " | NS | 0.005 | 0.002 |
| 1,3-Dichlorobenzene | 541-73-1 | " | NS | 0.005 | 0.002 |
| 1,4-Dichlorobenzene | 106-46-7 | " | NS | 0.005 | 0.002 |
| Butylbenzene | 104-51-8 | " | NS | 0.005 | 0.002 |
| 1,2-Dichlorobenzene | 95-50-1 | " | NS | 0.005 | 0.002 |
| 1,2-Dibromo-3-chloropropane | 96-12-8 | " | NS | 0.005 | 0.002 |
| 1,2,4-Trichlorobenzene | 120-82-1 | " | NS | 0.005 | 0.002 |
| Hexachlorobutadiene | 87-68-3 | " | NS | 0.005 | 0.002 |
| Naphthalene | 91-20-3 | " | NS | 0.005 | 0.002 |
| 1,2,3-Trichlorobenzene | 87-61-6 | " | NS | 0.005 | 0.002 |

* - EPA 2017 Removal Management Levels (June 2017)

MS/MSD and LCS control limits are specified by the analytical laboratory.

NS – Not Specified

## Worksheet #15.2: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) SVOCs by 8270D (Soil) – EPA PHILIS

**Matrix:** Soil and Water
**Analytical Group:** Compound List Semi-Volatile Organic Compounds
**Concentration Level:** Low Level Soil Medium Level Water

| Analyte | CAS Number | Project Action Limits* | Project Quantitation Limit | Method 8270D Soil Low Quantitation Level mg/kg | Method 8270D Water Low Quantitation Level mg/L |
|---|---|---|---|---|---|
| 1,2,4-Trichlorobenzene | 120-82-1 | EPA Removal Management Levels (RMLs) See Attachment A | NS | 0.083 | 0.025 |
| 1,2-Dichlorobenzene | 95-50-1 | | NS | 0.083 | 0.025 |
| 1,3-Dichlorobenzene | 541-73-1 | | NS | 0.083 | 0.025 |
| 1,4-Dichlorobenzene | 106-46-7 | | NS | 0.083 | 0.025 |
| 1-Methylnaphthalene | 90-12-0 | | NS | 0.083 | 0.025 |
| 2,4,5-Trichlorophenol | 95-95-4 | | NS | 0.083 | 0.025 |
| 2,4,6-Trichlorophenol | 88-06-2 | | NS | 0.083 | 0.025 |
| 2,4-Dichlorophenol | 120-83-2 | | NS | 0.083 | 0.025 |
| 2,4-Dimethylphenol | 105-67-9 | | NS | 0.083 | 0.025 |
| 2,4-Dinitrophenol | 51-28-5 | | NS | 0.167 | 0.050 |
| 2,4-Dinitrotoluene | 121-14-2 | | NS | 0.083 | 0.025 |
| 2,6-Dinitrotoluene | 606-20-2 | | NS | 0.083 | 0.025 |
| 2-Chloronaphthalene | 91-58-7 | | NS | 0.083 | 0.025 |
| 2-Chlorophenol | 95-57-8 | | NS | 0.083 | 0.025 |
| 2-Methyl-4,6-dinitrophenol | 534-52-1 | | NS | 0.083 | 0.025 |
| 2-Methylnaphthalene | 91-57-6 | | NS | 0.083 | 0.025 |
| 2-Methylphenol | 95-48-7 | | NS | 0.083 | 0.025 |
| 2-Nitroaniline | 88-74-4 | | NS | 0.083 | 0.025 |
| 2-Nitrophenol | 88-75-5 | | NS | 0.083 | 0.025 |
| 3/4-Methylphenol | 106-44-5 | | NS | 0.083 | 0.025 |
| 3-Nitroaniline | 99-09-2 | | NS | 0.083 | 0.025 |
| 4-Bromophenyl phenyl ether | 101-55-3 | | NS | 0.083 | 0.025 |
| 4-Chloro-3-methylphenol | 59-50-7 | | NS | 0.083 | 0.025 |
| 4-Chloroaniline | 106-47-8 | | NS | 0.083 | 0.025 |
| 4-Chlorophenyl phenyl ether | 7005-72-3 | | NS | 0.083 | 0.025 |

## Worksheet #15.2: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) SVOCs by 8270D (Soil) – EPA PHILIS *(Continued)*

| Analyte | CAS Number | | Project Quantitation Limit | Method 8270D Soil Low Quantitation Level mg/kg | Method 8270D Water Low Quantitation Level mg/L |
|---|---|---|---|---|---|
| Trichloroethene | 79-01-6 | Project Action Limits* | NS | 0.083 | 0.025 |
| 1,2-Dichloropropane | 78-87-5 | | NS | 0.083 | 0.025 |
| Dibromomethane | 74-95-3 | | NS | 0.083 | 0.025 |
| Bromodichloromethane | 75-27-4 | | NS | 0.083 | 0.025 |
| 4-Nitroaniline | 100-01-6 | | NS | 0.083 | 0.025 |
| 4-Nitrophenol | 100-02-7 | | NS | 0.167 | 0.050 |
| Acenaphthene | 83-32-9 | | NS | 0.083 | 0.025 |
| Acenaphthylene | 208-96-8 | | NS | 0.083 | 0.025 |

## Worksheet #15.2: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) SVOCs by 8270D (Soil) – EPA PHILIS *(Continued)*

**Matrix:** Soil and Water
**Analytical Group:** Compound List Semi-Volatile Organic Compounds
**Concentration Level:** Low Level Soil Medium Level Water

| Analyte | CAS Number | Project Action Limits* | Project Quantitation Limit | Method 8270D Soil Low Quantitation Level mg/kg | Method 8270D Water Low Quantitation Level mg/L |
|---|---|---|---|---|---|
| Aniline | 62-53-3 | EPA Removal Management Levels (RMLs) See Attachment A | NS | 0.083 | 0.025 |
| Anthracene | 120-12-7 | | NS | 0.083 | 0.025 |
| Benzo(a)anthracene | 56-55-3 | | NS | 0.083 | 0.025 |
| Benzo(a)pyrene | 50-32-8 | | NS | 0.083 | 0.025 |
| Benzo(b)fluoranthene | 205-99-2 | | NS | 0.083 | 0.025 |
| Benzo(g,h,i)perylene | 191-24-2 | | NS | 0.083 | 0.025 |
| Benzo(k)fluoranthene | 207-08-9 | | NS | 0.083 | 0.025 |
| Benzyl alcohol | 100-51-6 | | NS | 0.083 | 0.025 |
| Bis(2-chloroethoxy) methane | 111-91-1 | | NS | 0.083 | 0.025 |
| Bis(2-chloroethyl) ether | 111-44-4 | | NS | 0.083 | 0.025 |
| Bis(2-chloroisopropyl) ether | 108-60-1 | | NS | 0.083 | 0.025 |
| Bis(2-ethylhexyl) phthalate | 117-81-7 | | NS | 0.167 | 0.050 |
| Butyl benzyl phthalate | 85-68-7 | | NS | 0.083 | 0.025 |
| Carbazole | 86-74-8 | | NS | 0.083 | 0.025 |
| Chrysene | 218-01-9 | | NS | 0.083 | 0.025 |
| Dibenz(a,h)anthracene | 53-70-3 | | NS | 0.083 | 0.025 |
| Dibenzofuran | 132-64-9 | | NS | 0.083 | 0.025 |
| Diethyl phthalate | 84-66-2 | | NS | 0.083 | 0.025 |
| Dimethyl phthalate | 131-11-3 | | NS | 0.083 | 0.025 |
| Di-n-butyl phthalate | 84-74-2 | | NS | 0.083 | 0.025 |
| Di-n-octyl phthalate | 117-84-0 | | NS | 0.167 | 0.050 |
| Fluoranthene | 206-44-0 | | NS | 0.083 | 0.025 |
| Fluorene | 86-73-7 | | NS | 0.083 | 0.025 |
| Hexachlorobenzene | 118-74-1 | | NS | 0.083 | 0.025 |
| Hexachlorobutadiene | 87-68-3 | | NS | 0.083 | 0.025 |
| Hexachlorocyclopentadiene | 77-47-4 | | NS | 0.083 | 0.025 |

## Worksheet #15.2: Project Action Limits and Laboratory Reporting Limits – Target Analyte List (TAL) SVOCs by 8270D (Soil) – EPA PHILIS *(Continued)*

| Analyte | CAS Number | | Project Quantitation Limit | Method 8270D Soil Low Quantitation Level mg/kg | Method 8270D Water Low Quantitation Level mg/L |
|---|---|---|---|---|---|
| Hexachloroethane | 67-72-1 | Project Action Limits* | NS | 0.083 | 0.025 |
| Indeno(1,2,3-cd)pyrene | 193-39-5 | | NS | 0.083 | 0.025 |
| Isophorone | 78-59-1 | | NS | 0.083 | 0.025 |
| Naphthalene | 91-20-3 | | NS | 0.083 | 0.025 |
| Nitrobenzene | 98-95-3 | | NS | 0.083 | 0.025 |
| N-Nitrosodi-n-propylamine | 621-64-7 | | NS | 0.083 | 0.025 |
| Pentachlorophenol | 87-86-5 | | NS | 0.083 | 0.025 |
| Phenanthrene | 85-01-8 | | NS | 0.083 | 0.025 |
| Phenol | 108-95-2 | | NS | 0.083 | 0.025 |
| Pyrene | 129-00-0 | | NS | 0.083 | 0.025 |

* - EPA 2017 Removal Management Levels

MS/MSD and LCS control limits are specified by the analytical laboratory.

NS – Not Specified

Project Action Limits (PALs) vary by matrix and data use; the PALs will be defined as part of the site scoping process.

## Worksheet #15.3: Laboratory Reporting Limits – PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) by GC/MS by GCMS (Water) – Pace Analytical Energy Lab

| Analyte | Units | Laboratory Limits | | Accuracy and Precision Criteria | | | |
|---|---|---|---|---|---|---|---|
| | | Lab RL | Lab MDL | LCS Recovery Limits | LCS Precision | MS/MSD Recovery Limits | MS/MSD Precision |
| Isopentane (2-Methylbutane) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Pentene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methyl-1-butene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Pentane (nC5) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| trans-2-pentene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| cis-2-pentene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methyl-2-butene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,2-Dimethylbutane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Cyclopentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,3-Dimethylbutane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Methyl-tert-butyl ether (MTBE) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3-Methylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Hexene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Hexane (nC6) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Di-isopropyl ether (DIPE) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| trans-2-hexene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methyl-2-pentene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| cis-2-hexene (t ) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| cis-3-Methyl-2-pentene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Ethyl-tert-butyl ether (ETBE) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,2-Dimethylpentane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Methylcyclopentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,4-Dimethylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2-Dichloroethane (EDC) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Benzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3,3-Dimethylpentane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |

## Worksheet #15.3: Laboratory Reporting Limits – PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) by GC/MS by GCMS (Water) – Pace Analytical Energy Lab *(Continued)*

| Analyte | Units | Laboratory Limits | | Accuracy and Precision Criteria | | | |
|---|---|---|---|---|---|---|---|
| | | Lab RL | Lab MDL | LCS Recovery Limits | LCS Precision | MS/MSD Recovery Limits | MS/MSD Precision |
| Thiophene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Cyclohexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methylhexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,3-Dimethylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Tert-amyl methyl ether (TAME) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3-Methylhexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| trans-1,3-Dimethylcyclopentane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| cis-1,3-Dimethylcyclopentane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| trans-1,2-Dimethylcyclopentane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,2,4-Trimethylpentane (isooctane) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Heptene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Heptane (nC7) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| trans-2-heptene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Methylcyclohexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,5-Dimethylhexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,2,3-Trimethylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,4-Dimethylhexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,3,4-Trimethylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,3,3-Trimethylpentane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Toluene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methylthiophene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,3-Dimethylhexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3-Methylthiophene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methylheptane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 4-Methylheptane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3-Methylheptane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3-Ethylhexane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |

## Worksheet #15.3: Laboratory Reporting Limits – PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) by GC/MS by GCMS (Water) – Pace Analytical Energy Lab *(Continued)*

| Analyte | Units | Laboratory Limits | | Accuracy and Precision Criteria | | | |
|---|---|---|---|---|---|---|---|
| | | Lab RL | Lab MDL | LCS Recovery Limits | LCS Precision | MS/MSD Recovery Limits | MS/MSD Precision |
| 1,2-Dibromoethane (EDB) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Octene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Octane (nC8) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,4-Dimethylheptane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,5-Dimethylheptane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Ethylthiophene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2,3-Dimethylheptane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| m-Xylene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| p-Xylene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 4-Methyloctane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methyloctane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 3-Methyloctane (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Styrene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| o-Xylene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Nonene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Nonane (nC9) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Isopropylbenzene (cumene) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| n-Propylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-3-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-4-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,3,5-Trimethylbenzene (mesitylene) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-2-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2,4-Trimethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Decene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Decane (nC10) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| sec-Butylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |

## Worksheet #15.3: Laboratory Reporting Limits – PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) by GC/MS by GCMS (Water) – Pace Analytical Energy Lab *(Continued)*

| Analyte | Units | Laboratory Limits | | Accuracy and Precision Criteria | | | |
|---|---|---|---|---|---|---|---|
| | | Lab RL | Lab MDL | LCS Recovery Limits | LCS Precision | MS/MSD Recovery Limits | MS/MSD Precision |
| 1-Methyl-3-isopropylbenzene (m-cymene) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-4-isopropylbenzene (p-cymene) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Indane | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Indene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-2-isopropybenzene (o-cymene) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-3-propylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-4-propylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| n-Butylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,3-Dimethyl-5-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2,diethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methyl-2-propylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,4-Dimethyl-2-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,3-Dimethyl-4-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2-Dimethyl-4-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,3-Dimethyl-2-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2-Dimethyl-3-ethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Undecane (nC11) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2,4,5-Tetramethylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2,3,5-Tetramethylbenzene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| n-Pentylbenzene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Naphthalene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Benzothiophene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| Dodecane (nC12) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1,2,3,4-Tetramethylbenzene (t) | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| MMT | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 2-Methylnaphthalene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |
| 1-Methylnaphthalene | ug/L | 10 | 10 | 50 - 140 | 15% | 50 - 140 | 15% |

## Worksheet 17 — Sampling Design and Rationale

(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

**Sampling Tasks:**

Surface Water samples will be collected at approximately five locations adjacent to the Arkema, Inc. chemical plant. Sample locations will be detemined in the field by EPA and the EPA-Contractor. The data will be evaluated to assess whether there are concentrations of the chemicals of concern present in Surface Water samples that may be harmful to human health and the environment.

Samples will be collected using equipment and procedures appropriate for Surface Water sampling and associated parameters. The volume of the sample collected must be sufficient to perform the laboratory analysis requested. Samples must be stored in the proper types of containers and preserved in a manner appropriate to the analysis to be performed. Samples will be collected with laboratory provided, clean unpresevered amber jars and poured into their respective pre-cleaned, unused glass or plastic containers as appropriate based on the particular analytical method (Worksheet 19&30). Sampling personnel will change gloves and use a dedicated amber jar for each sample collection point. All samples will be assembled and catalogued prior to shipping to the designated laboratory.

Samples collected by EPA during this sampling task will be delivered to the EPA PHILIS mobile laboratory for VOCs and SVOCs analysis. A subset of the samples will also be submitted to Eurofins Lancaster Laboratory for VOC and SVOC Tentiatively Indentified Compound (TICs) spectra analysis. A subset of the samples will also be submitted to Pace Analytical Energy Lab for PIANO gasoline range fingerprinting (C3-C12 Quantitative Molecular Characterization) analysis and Full Scan C8-C40 Qualitative Molecular Characterization analysis.

Surface Water sampling activities will be conducted in accordance with guidelines outlined in EPA Contractor and EPA/ERT Sampling SOPs outlined in Worksheet 21.

### *Field Blanks*

Field blanks consist of blank matrix samples collected in the field. Field blanks include ambient field blanks, equipment blanks and trip blanks. Each field blank type is described below.

### *Ambient Field Blank*

An ambient field blank is primarily used to provide information about contaminants that may be introduced into samples from the atmosphere during sample collection. In addition, the ambient field blank may also be exposed to contamination during storage, transport, sample preparation, and analysis.

The ambient field blank is an aqueous sample exposed to field conditions to evaluate the potential for contamination by ambient site contaminants from a source not associated with the other field samples collected. Ambient field blank samples will only be collected as water samples for volatile constituents.

Analyte-free water, typically deionized (DI) water, is carried to the sampling site in sealed containers, exposed to sampling conditions upon transfer into sample containers, preserved, transported to the laboratory, and treated as an environmental sample.

Ambient field blanks will be collected at a minimum frequency of one per day per for the Arkemia surface water sampling event. Ambient field blanks will be shipped to the same laboratory as the associated samples and analyzed for the same analytical parameters.

***Trip Blank***

A trip blank is primarily used to provide information about volatile contaminants that may be introduced into field samples during transport and sample storage. A trip blank is a sample prepared in the field or in the laboratory, accompanies the sample bottles to the laboratory, and is analyzed for the same volatile target analytes as the associated field samples. For trip blanks prepared in the field, DI water is placed into pre-preserved sample containers. Because trip blanks are transported, stored, prepared and analyzed in the laboratory, they may be exposed to contamination from both field and laboratory sources. The method blank results, which would aid in identifying laboratory contaminants, are used to evaluate potential sources of contamination in trip blanks during data validation and the qualified trip blank results are compared with field sample results to assess the potential for contamination of field samples during transport and storage.

Trip blanks will be collected at a minimum frequency of one per cooler of soil samples. Trip blanks will be shipped to the same laboratory as the associated VOC samples and analyzed for the same list of target analytes.

***Field Duplicate (Co-located)***

Co-located field duplicates are independent samples collected from side-by-side locations at the same point in time and space to be considered identical. A co-located field duplicate samples will be collected at a frequency of 5% (1 field duplicate for every 20 samples collected per matrix).

***Temperature Indicator***

A temperature indicator is a container of water that is packed and shipped to the laboratory with the field samples requiring preservation by cooling to 4 degrees Celsius (°C) (±2°C). Upon opening the sample cooler, the laboratory measures the temperature of the temperature indicator. The temperature reading is used to document whether field samples were received within the acceptable temperature range. This information is used by both the laboratory and by the data validator. If the temperature indicator is outside the acceptance criteria, the laboratory is expected to notify the Project Chemist immediately for guidance on whether to proceed with analysis. It should be noted that samples received by the laboratory on the same day as collection may not have adequate time to achieve ideal preservation temperatures. However, by providing the laboratory documentation as evidence that the preservation process is underway during sample receipt (e.g., solid ice remaining in the cooler), data quality will not likely be impacted.

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## Worksheet 18 — Sampling Locations and Methods

(UFP-QAPP Manual Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Sections 2.3.1 and 2.3.2)

| Sampling Location / ID | Matrix | No. | Type | Analyte/Analytical Group | Sampling SOP Reference[1] | Comments |
|---|---|---|---|---|---|---|
| Arkema / Sample Event-sequence-location--date | Water | 5 | Surface Water | VOCs and SVOCs, | Worksheet 21 | Samples submitted to EPA PHILIS Mobile Laboratory |
| Arkema / Sample Event-sequence-location--date | Water | 5 | Surface Water | VOC-TICs and SVOC-TICs | Worksheet 21 | Samples submitted to Eurofins Lancaster Laboratories, Inc. |
| Arkema / Sample Event-sequence-location--date | Water | 5 | Surface Water | PIANO gasoline range fingerprinting (C3-C12 Quantitative Molecular Characterization) analysis by GC/MS and Full Scan C8-C40 Qualitative Molecular Characterization analysis by GC/MS. | Worksheet 21 | Samples submitted to Pace Analytical Energy Laboratory. |

[1] Sampling SOPs references will be provided in Worksheet 21.
PIANO - n-Paraffins (P), Iso-paraffins (I), Aromatics (A), Naphthenes (N) and Olefins (O)

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## Worksheet 19 & 30 — Sample Containers, Preservation, and Hold Times

(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Samples collected during Hurricane Harvey response Arkema Inc., Surface Water Sampling Event will be delivered to the EPA PHILIS mobile lab and shipped to Eurofins Lancaster Laboratory and Pace Energy Laboratory.

QAPP Worksheet 19 & 30 tabulates the sample containers and preservation requirements for each analysis and matrix type. This list is based on Laboratory bottleware and preservation requirements. Containers used for sample collection are pre-cleaned Laboratory Quality Certified bottles. Technical holding times for sample preparation and analysis are listed in this worksheet.

Data package turnaround times may vary by analysis/laboratory; however, sample submittal, requested turnaround times and data deliverable dates are documented in the Hurricane Harvey Sample Tracking spreadsheet which is part of the project file. The data package turnaround times will also be cited on the COC forms as directed by EPA.

## Worksheet 19 & 30 — Sample Containers, Preservation, and Hold Times *(Continued)*

(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

**Laboratory :** EPA PHILIS Mobile Laboratory, Eurofins Lancaster Laboratories and Pace Analytical Energy Laboratory
**List Any Required Accreditations/Certifications:** NA
**Back-up Laboratory:** NA
**Sample Delivery Method:** Drop-off at Laboratory or ship Fed-Ex

| Analytical Group (Concentration Level) | Matrix | Analytical Method | Containers (number, size, type per sample) | Preservation Requirements (chemical, temperature, light protected) | Technical Hold Time (Sample Preparation) | Technical Hold Time (Analysis) |
|---|---|---|---|---|---|---|
| VOCs (Low/Med) EPA PHILIS Lab | Water | EPA 5030B/ EPA 8260C | (3) 40-mL glass VOA vials | HCl pH<2, Iced to ≤6ºC, not frozen | None. | 14 days from collection |
| SVOCs (Low) EPA PHILIS Lab | Water | EPA 3510C/8270D | (2) 1-L amber glass with PTFE-lined lid | Iced to ≤6ºC, not frozen | 7 days from sampling to extraction | 40 days (extraction to analysis) |
| VOC-TICs Eurofins Lancaster Lab | Water | EPA 5030B/ EPA 8260C | (3) 40-mL glass VOA vials | Iced to ≤6ºC, not frozen | None. | 7 days from collection |
| SVOC-TICs Eurofins Lancaster Lab | Water | EPA 3510C/8270D | (2) 1-L amber glass with PTFE-lined lid | Iced to ≤6ºC, not frozen | 7 days from sampling to extraction | 40 days (extraction to analysis) |
| PIANO Gasoline Range Fingerprinting Pace Analytical Energy Lab | Water | S-PAE-PF-007 C3-C12 Gasoline Range Fingerprinting by GC/MS P/T (Modified EPA 8260C) Rev00 | (2) 40-mL glass VOA vials | HCl pH<2, Iced to ≤6ºC, not frozen | 14 days (sampling to extraction) | 40 days (extraction to analysis) |

## Worksheet 19 & 30 — Sample Containers, Preservation, and Hold Times *(Continued)*

(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

| Analytical Group (Concentration Level) | Matrix | Analytical Method | Containers (number, size, type per sample) | Preservation Requirements (chemical, temperature, light protected) | Technical Hold Time (Sample Preparation) | Technical Hold Time (Analysis) |
|---|---|---|---|---|---|---|
| Full Scan C8-C40 Qualitative Molecular Characterization Pace Analytical Energy Lab | Water | S-PAE-PF-001, GC/MS Full Scan Analysis. Rev00, 1/13/2016 | (2) 1-L amber glass with PTFE-lined lid | Iced to ≤6ºC | 7 days from sampling to extraction | 40 days (extraction to analysis) |

Volumes presented in this table should be considered maximum sample amounts needed by the laboratory and include sufficient sample for re-extraction/re-digestion if needed.

## Worksheet 20 — Field Quality Control Sample Summary

(UFP-QAPP Manual Sections 3.1.1 and 3.1.2.)
(EPA 2106-G-05 Section 2.3.5)

| Matrix | Analyte/Analytical Group | No. of Field Samples[1] | No. of Field Duplicates | No. of MS/MSD | No. of Field Blanks | No. of Equip. Blanks | No. of Trip Blanks | No. of Other | Total No. of Samples to Laboratory |
|---|---|---|---|---|---|---|---|---|---|
| Surface Water | VOCs and SVOCs | 5 | 1 | 1 | 1 | NA | 1 (VOCs) | NA | 10 |
| Surface Water | VOC-TICs, SVOC-TICs | 5 | 1 | 1 | 1 | NA | 1 (VOCs) | NA | 10 |
| Surface Water | PIANO Gasoline Range Fingerprinting; Full Scan C3-C12 Quantitative Molecular Characterization and C8-C40 Qualitative Molecular Characterization | 5 | 1 | 1 | 1 | NA | 1 (VOCs) | NA | 10 |

[1] Samples that are collected at different depths at the same location, and analyzed separately, will be counted as separate field samples. Even if they are taken from the same container as the parent field sample, MS/MSDs are counted separately, because they are analyzed separately.
NA – Not Applicable

Project-specific QC samples may include field duplicate, field blank, equipment blank, trip blank, MS/MSD samples and will be collected in accordance with the frequencies recorded on Worksheet 12.

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## Worksheet 21 — Field SOPs

(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

The Hurricane Harvey Team uses two main categories of Field SOPs for field operations:

- EPA Contractor SOPs are generally divided into task or activity-specific categories, such as sample collection, field screening instruments, field screening kits/methods, and monitoring well installation SOPs. A list of typical contractor Field SOPs are provided in Worksheet 21.1 and included in Appendix K.

- EPA Environmental Response Team (ERT) SOPs are also used for field operations. A complete list of EPA ERT SOPs is included in Worksheet 21.2 and Appendix K. The EPA ERT may also be downloaded from the following location: www.response.epa.gov/site/doc_list.aspx?site_id=2107&category=Field%20Activities

## Worksheet 21.1 — EPA Contractor (Weston) Field SOPs

| SOP Number or Reference | Title, Revision, Date, and URL (if available) | Originating Organization | SOP Option or Equipment Type (if SOP provides different options) | Modified for Project? Y/N | Comments |
|---|---|---|---|---|---|
| **Task Specific** | | | | | |
| **Documentation** | | | | | |
| SOP #1501.01 | Field Documentation – Field Log Book | EPA Contractor | Site-specific | N | None |
| SOP #1502.01 | Photographic Documentation | EPA Contractor | Site-specific | N | None |
| SOP #1502.02 | Photograph Management and Reporting | EPA Contractor | Site-specific | N | None |
| SOP #1101.01 | Sample Custody in the Field | EPA Contractor | Site-specific | N | None |
| **Water Sampling** | | | | | |
| SOP # 1002.01 | Surface Water Sampling | EPA Contractor | Site-specific | N | None |
| SOP #1201.01 | Decontamination Procedures | EPA Contractor | Project-specific | Project-specific | None |

## Worksheet 21 — Field SOPs *(Continued)*

(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

| SOP Number or Reference | Title, Revision, Date, and URL (if available) | Originating Organization | SOP Option or Equipment Type (if SOP provides different options) | Modified for Project? Y/N | Comments |
|---|---|---|---|---|---|
| SOP #0110.04 | On-Site Sample Nomenclature – On-Site Sampling Activities | EPA Contractor | Project-specific | Project-specific | None |

## Worksheet 21.2 — EPA ERT SOPs

| SOP Number or Reference | Title, Revision, Date, and URL (if available) | Originating Organization | SOP Option or Equipment Type (if SOP provides different options) | Modified for Project? Y/N | Comments |
|---|---|---|---|---|---|
| 2001 | General Field Sampling Guidelines, 6/2011 | U.S. EPA, ERT | Site-specific | N | None |
| 2005 | Quality Assurance/Quality Control Samples | U.S. EPA, ERT | Site-specific | N | None |
| 2006 | Sampling Equipment Decontamination, 12/2015 | U.S. EPA, ERT | Non-phosphate Detergent, Tap Water. Distilled/Deionized Water, 10% Nitric Acid, Solvent Rinse (Pesticide Grade) | N | None |
| 2012 | Soil Sampling, 6/2011 | U.S. EPA, ERT | Site-specific | N | None |
| 2139 | Multi Gas Monitor PGM-50/Photoionization Detector (PID) MultiRAE Plus, 6/20/2011 | U.S. EPA, ERT | Site-specific | N | None |

Environmental samples are being collected for analysis through the a EPA Contractor-subcontracted laboratory.

During sampling activities, IDW may be generated. IDW may consist of decontamination fluids, drill cuttings, purge/development water, excess sampled media (e.g., soil, sediment, water, etc.), disposable sampling supplies, and personal protective equipment (PPE) (e.g., Tyvek/Saranex coveralls, gloves, booties, etc.). Handling of IDW will be performed according with SOP 2049 as listed above and procedures described in *Management of Investigation Derived Wastes during Site Inspections, May 1991*. Waste disposal for IDW will be dependent upon classification of the waste as either RCRA hazardous or RCRA nonhazardous waste.

## Worksheet 22 — Field Equipment Calibration, Maintenance, Testing, and Inspection

(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

WESTON field personnel are responsible for the calibration of WESTON field equipment and field equipment provided by subcontractors. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted. Items may include, but are not limited to those identified in the table below.

| Field Equipment | Calibration Activity | Maintenance Activity | Testing Activity | Inspection Activity | Frequency | Acceptance Criteria | Corrective Action | Title or Position of Responsible Person | SOP Reference[1] |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Tools (Dedicated Laboratory-clean 1-L jar) | NA | NA | NA | Visually inspect for obvious defects or broken parts | Prior to use | NA | Replace | Field Team Leader | 1002.01 |
| Photoionization Detector (PID) | Calibrate with span gas, as recommended by manufacturer | Check battery | Calibration check/ Bump Test | Visually inspect equipment | Daily before use and as needed during day | Refer to instrument SOP | If instrument cannot be calibrated, replaced with another unit. | Field Team Leader | 2139 MultiRae |
| Disposable, inert sample mixing containers | NA | NA | NA | Visually inspect for cleanliness | Prior to use | NA | Replace | Field Team Leader | NA |

[1] Refer to Field SOPs (Worksheets 21.1 and 21.2) .

## Worksheet 23 — Analytical SOPs

(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

The table below lists the current SOPs that are being utilized by the EPA PHILIS Mobile Lab, Eurofins Lancaster Laboratories and Pace Analytical Energy Laboratory for analysis of aqueous associated with the Arkema, Inc. Surface Water sampling event.

| Lab SOP Number | Title, Revision Date, and/or Number and URL (if available) | Screening or Definitive Data | Matrix/Analytical Group | Instrument | Oranization Performing Analysis | Modified for Project? (Y/N) |
|---|---|---|---|---|---|---|
| L-A-101 Rev 7 | METHOD 8260C<br>VOLATILE ORGANIC COMPOUNDS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY (GC/MS) | Definitive | Water /VOCs | GC/MS | EPA PHILIS Mobile Lab | N |
| L-A-201 Rev 7 | METHOD 8270D<br>SEMIVOLATILE ORGANIC COMPOUNDS BY GC/MS | Definitive | Water /SVOCs | GC/MS | EPA PHILIS Mobile Lab | N |
| T-VOA-WI8197, Rev. 25; and T-VOA-WI8330, Rev. 9 | Determination of Volatile Target Compounds and Gasoline Range<br>Organics (GRO) by GCMS in Waters and Wastewaters by Method<br>8260B, 8/17/2017; and Volatile Organics Tentatively identified Compound Method, 6/24/2016 | Definitive | Water /VOC-TICs | GC/MS | Eurofins Lancaster Laboratory | N |
| T-SVOA-WI9623, Rev. 16; and Semivolatile Organics Tentatively Identified Compound Method, Rev. 7 | Semivolatile Organic Compounds, Including DRO/ORO, by<br>Method 8270C in Aqueous and NonAqueous Matrices Using<br>GCMS, 8/32/2016; and Semivolatile Organics Tentatively Identified Compound<br>Method, 8/23/2016 | Definitive | Water /SVOC-TICs | GC/MS | Eurofins Lancaster Laboratories | N |
| S-PAE-PF-001, Rev. 00 | PIANO: C3-C12 Gasoline Range Fingerprinting by GC/MS P/T (Modified EPA 8260C) | Definitive | Water /PIANO (C3-C12 Quantitative Molecular Characterization) | GC/MS | Pace Analytical Energy Laboratory | N |

Worksheet 23 — Analytical SOPs *(Continued)*
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

| **Lab SOP Number** | **Title, Revision Date, and/or Number and URL (if available)** | **Screening or Definitive Data** | **Matrix/Analytical Group** | **Instrument** | **Oranization Performing Analysis** | **Modified for Project?** (Y/N) |
|---|---|---|---|---|---|---|
| S-PAE-PF-001, Rev. 00 | GC/MS Full Scan Analysis, 1/13/2016 | Definitive | Water / Full Scan C8-C40 Qualitative Molecular Characterization | GC/MS | Pace Analytical Energy Laboratory | N |

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## Worksheet 24 — Analytical Instrument Calibration

(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

UFP-QAPP Worksheet 22 documents calibration procedures for field instrumentation. WESTON field personnel are responsible for the calibration of WESTON and sub-contractor provided analytical field equipment. Documented and approved procedures will be used for calibrating measuring and testing equipment. Widely accepted procedures, such as those published by EPA and ASTM, or procedures provided by manufacturers in equipment manuals will be adopted.

The responsibility for the calibration of laboratory equipment rests with the selected laboratories. Each type of instrumentation and each EPA-approved method have specific requirements for the calibration procedures, depending on the analytes of interest and the sample medium. Calibration procedures and calibration frequency for the equipment used to perform the analyses will be in accordance with requirements established by the EPA methods. The Laboratory Manager is ultimately responsible for ensuring that the laboratory instrumentation is maintained in accordance with specifications but the Laboratory Analyst or Bench Chemist is the person who performs these functions. Individual laboratory SOPs will be followed for corrective actions and preventative maintenance frequencies.

| Instrument | Calibration Procedure | Frequency of Calibration | Acceptance Criteria | Corrective Action (CA) | Title/Position Responsible for CA | SOP Reference[1] |
|---|---|---|---|---|---|---|
| GC/MS (PHILIS) | See 8260C, 8270D | Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria are not met or whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.) | See SOP L-A-101 Rev 7 and L-A-201 Rev 7 | Inspect system; correct problem; re-run calibration and affected samples | Lab Manager/ Analyst | See Method SOP in WS 23 |

## Worksheet 24 — Analytical Instrument Calibration *(Continued)*

(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

| Instrument | Calibration Procedure | Frequency of Calibration | Acceptance Criteria | Corrective Action (CA) | Title/Position Responsible for CA | SOP Reference[1] |
|---|---|---|---|---|---|---|
| GC/MS (Eurofins) | See 8260C, 8270D | Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria are not met or whenever the laboratory takes corrective action which may change or affect the initial calibration criteria (e.g., ion source cleaning or repair, column replacement, etc.) | T-VOA-WI8197, Rev. 25; T-VOA-WI8330, Rev. 9; T-SVOA-WI9623, Rev. 16; and Semivolatile Organics Tentatively Identified Compound Method, Rev. | Inspect system; correct problem; re-run calibration and affected samples | Lab Manager/ Analyst | See Method SOP in WS 23 |
| GC/MS (Pace Analytical Energy Lab) | See PIANO: C3-C12 Gasoline Range Fingerprinting by GC/MS P/T (Modified EPA 8260C) and GC/MS Full Scan Analysis, 1/13/2016 | Initial calibration after instrument set up, then when daily 12-hour calibration verification criteria are not met | For all target compounds, initial $r^2$ >0.90; and calibration verification % difference <15%: Qualatative Method - NA | Inspect system; correct problem; re-run calibration and affected samples; Qualatative Method - NA | Lab Manager/ Analyst | See Method SOP in WS 23 |

[1] Refer to the Analytical SOPs table (Worksheet 23).

GC/MS = Gas Chromatograph/Mass Spectrometer

## Worksheet 25 — Analytical Instrument and Equipment Maintenance, Testing, and Inspection

(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

All laboratories conducting analyses of samples collected during the Hurricane Harvey response will be required to have a preventative maintenance program covering testing, inspection, and maintenance procedures and a schedule for each measurement system and required support activity. The basic requirements and components include the following:

| Instrument/ Equipment | Maintenance Activity | Testing Activity | Inspection Activity | Frequency | Acceptance Criteria | Corrective Action (CA) | Title/ Position Responsible for CA | SOP Reference[1] |
|---|---|---|---|---|---|---|---|---|
| GC/MS (VOCs) | Replace septa, clean injection port, clip and replace column | Passing tunes and calibrations: EPA 8260C | Leak test, column and injection port inspection, source insulator integrity | As specified by method | Per method criteria: Passing BFB tunes, ICAL, and CCVs. Passing internal standards response. | Perform maintenance, check standards, recalibrate | Laboratory Analyst | See Method SOP in WS 23 |
| GC/MS (SVOCs) | Replace septa, clean injection port, clip and replace column | Passing tunes and calibrations: EPA 8270D | Leak test, column and injection port inspection, source insulator integrity | As specified by method | Per method criteria: Passing DFTPP, ICAL, and CCVs. Passing internal standards response. | Perform maintenance, check standards, recalibrate | Laboratory Analyst | See Method SOP in WS 23 |
| GC/MS Pace Anaytical Energy Lab (PIANO) | Replace septa, clean injection port, clip and replace column or trap | Passing tunes and calibrations: EPA 8260B/C | Leak test, column and injection port inspection, source insulator integrity | As specified by method | Per method criteria: ICAL, CCVs, Blanks, LCSs, SRMs. Passing internal standards response. | Perform maintenance, check standards, recalibrate | Laboratory Analyst | See Method SOP in WS 23 |

## Worksheet 25 — Analytical Instrument and Equipment Maintenance, Testing, and Inspection *(Continued)*

(UFP-QAPP Manual Section 3.2.3)
(EPA 2106-G-05 Section 2.3.6)

| Instrument/ Equipment | Maintenance Activity | Testing Activity | Inspection Activity | Frequency | Acceptance Criteria | Corrective Action (CA) | Title/ Position Responsible for CA | SOP Reference[1] |
|---|---|---|---|---|---|---|---|---|
| GC/MS<br>Pace Analytical Energy Lab (Full Scan) | Replace septa, clean injection port, clip and replace column | Passing tunes and mass discrimination checks, and target R.T. windows (ASTM 5739): | Leak test, column and injection port inspection, source insulator integrity | As specified by method | Per method criteria: Blanks, Reference Oil, and Passing absolute abundance, mass discrimination checks, and R.T. windows. | Perform maintenance, Check Multi-component Reference Oil | Laboratory Analyst | See Method SOP in WS 23 |

[1] Refer to the Analytical SOPs table (Worksheet 23).

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## Worksheet 26 & 27 — Sample Handling, Custody, and Disposal

(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Manual Section 2.3.3)

| **SAMPLE COLLECTION, PACKAGING, AND SHIPMENT** |
|---|
| **Sample Collection (Personnel/Organization):** EPA Region 6 Contractor - Weston Solutions, Inc. |
| **Sample Packaging (Personnel/Organization):** EPA Region 6 Contractor - Weston Solutions, Inc. |
| **Coordination of Shipment (Personnel/Organization):** EPA Region 6 Contractor - Weston Solutions, Inc. |
| **Type of Shipment/Carrier:** FedEx, Courier, and/or Hand-Delivered |
| **SAMPLE RECEIPT AND ANALYSIS** |
| **Sample Receipt (Personnel/Organization):** EPA PHILIS Lab, Eurofins Lancaster Lab and Pace Energy Lab |
| **Sample Custody and Storage (Personnel/Organization):** EPA PHILIS Lab, Eurofins Lancaster Lab and Pace Energy Lab |
| **Sample Preparation (Personnel/Organization):** LaboratoryEPA PHILIS Lab, Eurofins Lancaster Lab and Pace Energy Lab |
| **Sample Determinative Analysis (Personnel/Organization):** EPA PHILIS Lab, Eurofins Lancaster Lab and Pace Energy Lab |
| **SAMPLE ARCHIVING** |
| **Field Sample Storage (No. of days from sample collection):** All samples will be shipped same day or within 24 hours of collection |
| **Sample Extract/Digestate Storage (No. of days from extraction/digestion):** As per analytical methodology; see Worksheet #19 |
| **SAMPLE DISPOSAL** |
| **Personnel/Organization:** EPA PHILIS Lab, Eurofins Lancaster Lab and Pace Energy Lab |
| **Number of Days from Analysis:** Up to 60 days; Until analysis and QA/QC checks are completed; as per analytical methodology; see Worksheet #19. |

**Sample Identification Procedures:** Each sample will be labeled with the site identification code and a sample type letter code and number that depicts a specific location. Sample nomenclature wil consist of the following components:

- Sample Event Identification (ID)
- Sequence ID
- Sample Location
- Date
- Collection type (Soil, Field QC, etc.)
- QA/QC type (normal, duplícate, etc.)

The following presents the sample nomenclature for analytical samples that will generate unique sample names compatible with most data management systems. The sample nomenclature is based upon specific requirements for reporting these results.

**Where:**

**Sample Event ID:** An identifier used to designate the particular Sample Event (i.e. HH01 is the Arkema Surface Water Sampling Event). .

**Sequence ID:** A two- or three-character alphanumeric code used to designate the sample sequence if additional sampling activities are required.

**Sample Location:** A two-digit code used to designate the sample location.

**Date:** Year (##), Month (##), Date (##)

**Collection Type:** A one-digit code used to designate what type of sample was collected:

| | |
|---|---|
| 1 | Groundwater |
| 2 | Surface Water |
| 3 | Leachate |
| 4 | Field QC/Water Sample |
| 5 | Soil |

| | |
|---|---|
| 6 | Oil |
| 7 | Waste |
| 8 | Other |
| 9 | Drinking Water |
| 0 | Sediment |

**QC Type:** A one-digit code used to designate the QC type of the sample:

| | |
|---|---|
| 1 | Normal |
| 2 | Duplicate |
| 3 | Rinsate Blank |
| 4 | Trip Blank |
| 5 | Field Blank |

| | |
|---|---|
| 6 | Confirmation |
| 7 | Confirmation Duplicate |
| | |
| | |
| | |

**Example:**

- ***HH01-01-03-170901-22***: Represents a co-located (duplicate) surface water sample collected from Sample Location 03 on September 1, 2017. The sample was collected during the 1st Sample Sequence for the Arkema Surface Water Sampling Event.

Location of the samples collected will be recorded in the project database and site logbook. Depending on the type of sample, additional information such as sampling round, date, time etc. will be added.

**Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):** Each sample will be individually identified and labeled after collection, then sealed with custody seals and enclosed in a plastic cooler. The sample information will be recorded on chain-of custody (COC) forms, and the samples shipped to the appropriate laboratory via overnight delivery service or courier. Chain-of-custody records will accompany samples from the time of collection and throughout the shipping process. Each individual in possession of the samples must sign and date the sample COC Record. The chain-of-custody record will be considered completed upon receipt at the laboratory. A traffic report and chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook. The chain-of-custody record should include (at minimum) the following: 1) Sample identification number; 2) Sample information; 3) Sample location; 4) Sample date; 5) Sample Time; 6) Sample Type Matrix; 7) Sample Container Type; 8) Sample Analysis Requested; 9) Name(s) and signature(s) of sampler(s); and 10) Signature(s) of any individual(s) with custody of samples.

**Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal):** A sample custodian at the laboratory will accept custody of the shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. At this time, no samples will be archived at the laboratory. Disposal of the samples will occur only after analyses and QA/QC checks are completed.

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## Worksheet 28 — Analytical Quality Control and Corrective Action

(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Method selection and MPCs will be based on site-specific DQOs. The MPC listings in the worksheets in this section are based on the current analytical methods being conducted on samples collected during the Hurricane Harvey response Arkema Surface Water Sampling Event. Laboratory analyses will be expected to meet these minimum MPCs. Note – Routine VOCs and SVOCs analysis (including TICs) have QC and Corrective Action criteria is listed in Worksheets 28.1 and 28.2. PIANO Gasoline Range Fingerprinting Analysis and Full Scan C8-C40 Qualitative Molecular Characterization riteria is listed in Worksheets 28.3 and 28.4. The criteria listed below will apply to each laboratory as applicable to the method of analysis.

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## Worksheet #28.1: Analytical Quality Control and Corrective Action – VOCs by GC/MS – EPA PHILIS Lab

| QC Sample | Number/ Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Method Blank (MB) - Routine VOCs | 1 per analytical window (1 every 12 hours) | Method criteria same as Project-Specific MPC<br><br>Laboratory SOPs vary by method # | Investigate the source of contamination and eliminate the problem before proceeding with further analysis. (Corrective actions are required only if the samples contain the same contaminant at concentrations exceeding the MPC levels.)<br><br>**CA includes:**<br>Reanalyze the samples if sufficient sample volume remains.<br>Flag (qualify) the sample result.<br>Document the problem in the case narrative. | Lab Analyst | Analyte concentrations <MCL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater. |
| Trip Blank | 1 per cooler containing VOC samples | No criteria specified in method or SOPs | Investigate sources of trip blank contamination after method blank actions are applied and considering field blank contamination.<br>**CA includes:**<br>Review potential laboratory or field sources of contaminants (including type of water used to make the trip blank).<br>Once identified, Quality Manager or Chemist should share findings with PTL, SOW Managers, and field team.<br>Discuss trip blank contamination in EPA deliverables and any impacts on data quality. | WESTON PTL, Field Samplers, SOW Manager, Quality Manager, and Chemist | All analyte concentrations < RL |

## Worksheet #28.1: Analytical Quality Control and Corrective Action – VOCs by GC/MS *(Continued)*

| QC Sample | Number/ Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Laboratory Control Sample (LCS) – Routine VOCs | 1 per analysis or methanol extraction batch | None listed; laboratory must develop statistically-derived laboratory limits. | Investigate reason for poor LCS recovery. Eliminate problem before proceeding with further analysis.<br>**CA includes:**<br>If low spike recovery, reanalyze samples under compliant LCS, if sufficient sample volumes are available.<br>For any low or high LCS outliers, flag (qualify) any analytes in samples from the affected batch.<br>Document the problem in the case narrative. | Lab Analyst and Prep Analyst | %R within statistically-derived laboratory limits |
| Field Duplicate | 1 per 20 field samples of the same matrix | No method or SOP criteria specified | If MPC is not met for the field duplicate results > >4x RL, a careful examination of the sampling techniques, sample matrix, and analytical method and other analytical QC criteria will be conducted to identify the root cause of the high RPD and the usability of the data. | WESTON Field Samplers and Chemist | RPD ≤30% (Water) |
| Surrogates (DMCs) - Routine VOCs | Each field and QC sample | statistically-derived laboratory control limits | Investigate reason for poor surrogate recovery. Up to 3 DMCs per sample may fail to meet necessary limits<br>**CA includes**:<br>Reanalyze sample to confirm the problem is with the sample matrix and not the analysis. Report both sets of results if the reanalysis confirms the initial analysis. Otherwise, report only the compliant analysis. | Lab Analyst | %R within statistically-derived laboratory control limits |

## Worksheet #28.1: Analytical Quality Control and Corrective Action – VOCs by GC/MS *(Continued)*

| QC Sample | Number/ Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Internal Standards (IS) - Routine VOCs | Each field and QC sample | IS Area in the sample within -50% to +200% of the IS area in the opening CCV; ± 30 sec retention time shift | Investigate reason for poor IS performance.<br>If failure is due to instrument performance, the problem must be identified, corrected, and the sample must be reanalyzed.<br>**CA includes**:<br>Reanalyze sample and if upon reanalysis the IS area in the sample is still not within limits, report both the initial and reanalysis in the data package to document matrix interference. | Lab Analyst | IS area in the sample within -50% to +200% of the IS area in the opening CCV; ± 30 sec retention time shift |
| Cooler Temperature Indicator | One per cooler | ≤6°C (not frozen) | Laboratory to notify WESTON Chemist (WESTON-subcontracted lab only) and confirm whether to proceed with analysis. | Laboratory Sample Custodian/ WESTON Chemist | ≤6°C (not frozen) |

# Laboratory SOPs are retained on file for WESTON-subcontract laboratories.

## Worksheet #28.2: Analytical Quality Control and Corrective Action – SVOCs by GC/MS – EPA PHILIS LAB

| QC Sample | Number/Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Method Blank (MB) – Routine SVOCs | 1 per extraction batch | Method criteria same as Project-Specific MPC<br><br>Laboratory SOPs vary by method # | Investigate the source of contamination and eliminate the problem before proceeding with further analysis. (Corrective actions are required only if the samples contain the same contaminant at concentrations exceeding the MPC levels.)<br>**CA includes:**<br>Re-extract and reanalyze the samples if sufficient sample volume remains.<br>Flag (qualify) the sample result.<br>Document the problem in the case narrative. | Lab Analyst/Prep Analyst | analyte concentrations <MCL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater. |
| Laboratory Control Sample (LCS) Routine SVOCs | 1 per analysis or extraction batch | **:** None listed; laboratory must develop statistically-derived laboratory limits. | Investigate reason for poor LCS recovery. Eliminate problem before proceeding with further analysis.<br>**CA includes:**<br>If low spike recovery, re-extract and reanalyze samples under compliant LCS, if sufficient sample volumes are available.<br>For any low or high LCS outliers, flag (qualify) any analytes in samples from the affected batch.<br>Document the problem in the case narrative. | Lab Analyst and Prep Analyst | %R within statistically-derived laboratory limits |
| Field Duplicate | 1 per 20 field samples of the same matrix | No method or SOP criteria specified | If MPC is not met for the field duplicate results > 4x RL, a careful examination of the sampling techniques, sample matrix, and analytical method and other analytical QC criteria will be conducted to identify the root cause of the high RPD and the usability of the data. | WESTON Field Samplers and Chemist | RPD ≤50% (Soil)<br>RPD ≤30% (Water) |

## Worksheet #28.2: Analytical Quality Control and Corrective Action – SVOCs by GC/MS – EPA PHILIS LAB
*(Continued)*

| QC Sample | Number/Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Surrogates (DMCs) Routine SVOCs | Each field and QC sample | **:** statistically-derived laboratory control limits | Investigate reason for poor surrogate recovery.<br>**CA includes**:<br>Re-extract the sample to confirm the problem is with the sample matrix and not the extraction. Report both sets of results if the re-extraction confirms the initial analysis. Otherwise, report only the compliant analysis. | Lab Analyst | %R within statistically-derived laboratory control limits |
| Internal Standards (IS) Routine SVOCs | Each field and QC sample | IS Area in the sample within -50% to +100% of the IS area in the opening CCV | Investigate reason for poor IS performance.<br>If failure is due to instrument performance, the problem must be identified, corrected, and the sample must be reanalyzed.<br>**CA includes**:<br>Reanalyze sample and if upon reanalysis the IS area in the sample is still not within limits, report both the initial and reanalysis in the data package to document matrix interference. | Lab Analyst | IS area in the sample within -50% to +100% of the IS area in the opening CCV |
| Cooler Temperature Indicator | One per cooler | ≤6°C (not frozen) | Laboratory to notify WESTON Chemist (WESTON-subcontracted lab only) and confirm whether to proceed with analysis. | Laboratory Sample Custodian/ WESTON Chemist | ≤6°C (not frozen) |

# Laboratory SOPs are retained on file for WESTON-subcontract laboratories.

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## Worksheet #28.3: Analytical Quality Control and Corrective Action – PIANO Gasoline Range Fingerprinting Analysis (C3-C12 Quantitative Molecular Characterization) by GC/MS – Pace Analytical Energy Lab

| QC Sample | Number/ Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Method Blank (MB) | 1 per 20 samples | Results < RL | Repeat analysis, clean system as necessary | Lab Analyst | Refer to Method SOP |
| Laboratory Control Sample (LCS) | 1 per 20 samples | 50 – 140 | Repeat, reprepare as necessary | Lab Analyst | Refer to Method SOP |
| Surrogates (DMCs) | 3 surrogates / sample | 80 – 120 | EPA 8260C | Lab Analyst | Refer to Method SOP |

# Laboratory SOPs are retained on file for WESTON-subcontract laboratories.

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## Worksheet #28.4: Analytical Quality Control and Corrective Action –Full Scan C8-C40 Qualitative Molecular Characterization by GC/MS – Pace Analytical Energy Lab

| QC Sample | Number/ Frequency | Method/SOP Acceptance Criteria | Corrective Action (CA) | Title/position of person Responsible for Corrective Action | Project-Specific MPC |
|---|---|---|---|---|---|
| Method Blank (MB) | 5% | Blank must not exhibit petroleum hydrocarbon signatures from carryover | Rerun blanks and corresponding samples from the batch | Lab Analyst | Refer to Method SOP |
| Laboratory Control Sample (LCS) | NA (ASTM 5739) | NA (ASTM 5739) | NA (ASTM 5739) | Lab Analyst | Refer to Method SOP |
| Surrogates (DMCs) | NA (ASTM 5739)<br>Surrogate added for R.T. check | NA (ASTM 5739)<br>Surrogate added for R.T. check | NA (ASTM 5739)<br>Surrogate added for R.T. check | Lab Analyst | Refer to Method SOP |
| Internal Standards (IS) | NA (ASTM 5739)<br>I.S added for R.T. and instrument response checks | NA (ASTM 5739)<br>I.S added for R.T. and instrument response checks | NA (ASTM 5739)<br>I.S added for R.T. and instrument response checks | Lab Analyst | Refer to Method SOP |

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## Worksheet 29 — Project Documents and Records

(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

All records will be generated and verified by EPA or the EPA Contractor, stored electronically on the EPAserver. All hard and electronic copies of finalized documents and technical project documents (including but not limited to the QAPP, HASP, SAP, FSP, etc.) will be retained by EPA. Other project-related files, such as contract documents and other information will be retained in accordance with EPA and EPA Contractor Policies and Procedures.

| Sample Collection and Field Records | | | |
|---|---|---|---|
| **Record** | **Generation** | **Verification** | **Storage Location/Archival** |
| Field Logbook or Data Collection Sheets | PTL/Field Scientist | Delegated QA Manager | Project File |
| Chain-of-Custody Forms | PTL/Field Scientist | Delegated QA Manager | Project File |
| Correct ive Action Reports (if required) | Delegated QA Manager | Program Manager or designee | Project File |
| Correspondence | PTL | Delegated QA Manager | Project File |
| Field Sample Results/Measurements | PTL/Field Scientist | Delegated QA Manager | Project File |
| Tailgate Safety Meeting Items | PTL/Field Safety Officer | Delegated QA Manager | Project File |

| Project Assessments (if required) | | | |
|---|---|---|---|
| **Record** | **Generation** | **Verification** | **Storage Location/Archival** |
| Field Analysis Audit Checklist | Delegated QA Manager | SOW Manager | Project File |
| Fixed Laboratory Audit Checklist (if performed) | Delegated QA Manager | SOW Manager | Project File |
| Data Validation Report | Delegated QA Manager | SOW Manager | Project File |
| Data Usability Assessment Report | Delegated QA Manager | SOW Manager | Project File |
| Corrective Action Reports (if required) | Delegated QA Manager | SOW Manager | Project File |
| Correspondence | Delegated QA Manager | Program Manager or designee | Project File |

## Worksheet 29 — Project Documents and Records *(Continued)*

(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

| Laboratory Records | | | |
|---|---|---|---|
| **Record** | **Generation** | **Verification** | **Storage Location/Archival** |
| Sample Receipt, Custody, and Checklist | Laboratory Sample Receiving | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |
| Equipment Calibration Logs | Laboratory Technician | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |
| Sample Prep Logs | Laboratory Technician | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |
| Run Logs | Laboratory Technician | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |
| Equipment Maintenance, Testing, and Inspection Logs | Laboratory Technician/ Laboratory QA Manager | Laboratory PM/Delegated QA Manager | Laboratory File |
| Corrective Action Reports (if required) | Laboratory QA Manager | Laboratory PM/Delegated QA Manager | Laboratory File and Project File |
| Laboratory Analytical Results | Laboratory Technician/ Laboratory QA Manager | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |
| Laboratory QC Samples, Standards, and Checks | Laboratory Technician/ Laboratory QA Manager | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |
| Instrument Results (raw data) for Primary Samples, Standards, QC Checks, and QC Samples | Laboratory Technician/ Laboratory QA Manager | Laboratory PM/Delegated QA Manager | Laboratory Data Package and Project File |

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## Worksheet 31, 32 & 33 — Assessments and Corrective Action

(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5)

All reports will be prepared and distributed to the following, to include but not be limited to, the WESTON SOW Manager, Program Manager, and Quality Manager; and the EPA OSC, PO, TM, and QA Manager as applicable.

**Assessments:**

| Assessment Type | Responsible Party & Organization | Number/ Frequency | Estimated Dates | Assessment Deliverable | Deliverable Due Date |
|---|---|---|---|---|---|
| Field Sampling Technical Systems Audit (TSA)[1] | Quality Manager (or designee) and SOW Manager WESTON | None planned unless deemed necessary by WESTON or EPAby a notice of indicent | at time of notice of incident | TSA Memorandum and Checklist | within 48 hours |
| Laboratory TSA[2] | Laboratory QA Manager EPA, Eurofins and Pace Analytial Energy<br><br>Quality Manager (or designee) WESTON | Once a Year. None planned unless deemed necessary by EPA | as required | Analytical TSA Memorandum and Checklist | as required |
| Data Validation | Chemist WESTON | Each data package for which data validation was requested by EPA | As final deliverables are received | Data Validation Report | within 48hours of receipt |
| Management/Peer Review | Quality Manager and SOW Manager WESTON<br><br>QAO, Group Leader, and Readiness Coordinator EPA | Each Deliverable | As draft deliverables are received | Quality Management Report (memo/e-mail to file) | at project completion |

Worksheet 31, 32 & 33 — Assessments and Corrective Action *(Continued)*
(UFP-QAPP Manual Section 4.1.1 and 4.1.2)

**Assessment Response and Corrective Action:**

| Assessment Type | Responsibility for Responding to Assessment Findings | Assessment Response Documentation | Timeframe for Response | Responsibility for Implementing Corrective Action | Responsible for Monitoring Corrective Action Implementation |
|---|---|---|---|---|---|
| Field Sampling Technical Systems Audit (TSA)[1] | PTL<br>WESTON | Findings of field audit | 24 hours of receipt of audit report | SOW Manager<br>WESTON | PTL or SOW Manager<br>WESTON |
| Laboratory TSA[2] | Laboratory QA Manager<br>EPA, Eurofins, Pace Analytical Energy.<br><br>Quality Manager (or designee)<br>WESTON | Written response to EPA Region 6 subcontractor to address deficiencies | 1 week of receipt of request from EPA Region 6 (or EPA CONTRACTOR on behalf of EPA) | Laboratory Manager | Quality Manager (or designee) and/or Chemist<br>WESTON |
| Data Validation | Quality Manager (or designee) or Chemist<br>WESTON | Validation Report | Within 48 hours of receipt of validation inquiry | Laboratory QA Manager and/or Chemist | Chemist<br>WESTON |
| Management/Peer Review | SOW Manager<br>WESTON | Quality Management Response | 48 hours of receipt of Quality Management report | SOW Manager<br>WESTON | Quality Manager (or designee) and SOW Manager<br>WESTON |

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

## Worksheet 34 — Data Verification and Validation Inputs

(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Data Verification and Validation Inputs are identified in the table below.

| Item | Description | Verification (completeness) | Validation (conformance to specifications) |
|---|---|---|---|
| **Planning Documents/Records** | | | |
| **1** | Approved QAPP | X | |
| **2** | Contract | X | |
| **3** | Field SOPs | X | |
| **4** | Laboratory SOPs | X | |
| **5** | Laboratory QA Manual | X | |
| **6** | Laboratory Certifications | X | |
| **Field Records** | | | |
| **7** | Field Logbooks | X | X |
| **8** | Equipment Calibration Records | X | X |
| **9** | Chain of Custody Forms | X | X |
| **10** | Sampling Diagrams/Surveys | X | X |
| **11** | Relevant Correspondence | X | X |
| **12** | Change Orders/Deviations | X | X |
| **13** | Field Audit Reports | X | X |
| **14** | Field Corrective Action Reports | X | X |
| **15** | Sample Location Verification (Worksheet 18) | X | X |
| **Analytical Data Package and Other Laboratory Deliverables** | | | |
| **16** | Cover Sheet (laboratory identifying information) | X | X |
| **17** | Case Narrative | X | X |
| **18** | Internal Laboratory Chain of Custody | X | X |
| **19** | Sample Receipt Records | X | X |
| **20** | Sample Chronology (i.e. dates and times of receipt, preparation, & analysis) | X | X |
| **21** | Communication Records | X | X |
| **22** | Project-specific PT Sample Results (if analyzed) | X | X |
| **23** | Instrument Calibration Records | X | X |
| **24** | Definition of Laboratory Qualifiers | X | X |
| **25** | Results Reporting Forms | X | X |
| **26** | QC Sample Results | X | X |
| **27** | Corrective Action Reports | X | X |
| **28** | Raw Data | X | X |
| **29** | Electronic Data Deliverable | X | X |

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## Worksheet 35 — Data Verification (Step I) Procedures

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Data Verification is the process of evaluating the completeness, correctness, and conformance/compliance of a specific data set against the method, procedural, or contractual requirements. The verification process includes the verification of planning documents, completeness of analytical data packages, sampling documents, and external reports. The goal of data verification is to ensure and document that the data are what they purport to be, that is, that the reported results reflect what was actually done. If data deficiencies are identified, then those deficiencies should be documented for the data user's review and, where possible, resolved by corrective action. Data verification applies to activities in the field as well as in the laboratory.

The following information includes Hurricane Harvey Project documents which may be incorporated by reference in the site-specific SAP, FSP, or QAPP. Inputs may include, but are not limited to, those identified in the table below.

| Records Reviewed | Required Documents | Process Description | Responsible Person, Organization |
|---|---|---|---|
| Program QAPP | Contract, EPA and UFP-QAPP Guidance documents | Verify completeness, correctness, and contractual compliance of all program QA/QC against the methods, SOPs, and contract requirements. | WESTON Program Manager<br>WESTON Quality Manager |
| Site-specific Project QAPP | Project QAPP | Verify sampling and analytical methods specified in site- QAPP are correct and all Project QAPP protocols are followed and required QC samples will be collected in the correct bottles and properly preserved. | Project Chemist or Quality Manager |
| Field Logs and SOPs | QAPP | Ensure that all field sampling SOPs specified in site-specific FSP, SAP, or QAPP were followed. | WESTON SOW Manager and PTL |
| Analytical SOPs | Analytical Method and Project QAPP | Ensure that laboratory analytical SOPs comply with the published method. | Laboratory QA Manager, EPA PHILIS Lab, Eurofins Lab and Pace Analytical Energy Lab |
| Laboratory Certifications | Project and site-specific SAP, and/or QAPP | Ensure that laboratory performing analytical sample analyses has current State, National Environmental Laboratory Accreditation Program, National Voluntary Laboratory Accreditation Program, or American Industrial Hygiene Association certifications as required by the project. | Laboratory PM, EPA PHILIS Lab, Eurofins Lab and Pace Analytical Energy Lab<br>WESTON Chemist<br>WESTON Quality Manager |

## Worksheet 35 — Data Verification (Step I) Procedures *(Continued)*

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

| Records Reviewed | Required Documents | Process Description | Responsible Person, Organization |
|---|---|---|---|
| Laboratory Deliverables | Project QAPP | Verify that the laboratory deliverable contains all records specified in the Project QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported. Compare the data package with Chains of custody to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Review data per Data Validation Stage as requested by EPA. | Data Validator, WESTON<br>WESTON Chemist<br>WESTON Quality Manager |
| WESTON Data Validation Deliverables | Laboratory Report, Analytical Method and Laboratory SOPs | Data Validation will consist of a Stage 2A validation review unless otherwise specified by EPA and includes results for all field samples in the Data validation report (pdf) and Excel EDD file with the final data validation qualifiers | WESTON Data Validator<br>WESTON Chemist<br>WESTON Quality Manager |
| Field Logbook, Field Sheets, Sample Diagrams/ Surveys | Project QAPP | Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented. | WESTON SOW Manager and PTL |
| Field Equipment Calibration Records | Project QAPP, SOPs, field logbook | Ensure that all field analytical instrumentation SOPs for equipment calibration were followed. | WESTON SOW and PTL |

## Worksheet 35 — Data Verification (Step I) Procedures *(Continued)*

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

| Records Reviewed | Required Documents | Process Description | Responsible Person, Organization |
|---|---|---|---|
| Chain of Custody Forms | Project QAPP; Field Logbook; and other sampling records (e.g., boring logs, etc.) | Verify the completeness of Chain-of-Custody records. Examine entries for consistency with the field logbook. Check that appropriate methods were requested and sample preservation was recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for Laboratory QC samples (e.g., MS/MSD and S/D). Verify that all required signatures and dates are present. Check for transcription errors. | WESTON PTL/FTL<br>WESTON Chemist<br>WESTON Quality Manager<br>Laboratory PM, EPA PHILIS Lab, Eurofins Lab and Pace Analytical Energy Lab |
| Relevant reports and correspondence | Project QAPP | Verify that reports and/or records are present and complete for each day of field activities. Verify that correspondence is documented and was reported in accordance with requirements. | WESTON SOW Manager and PTL |
| Audit Reports, Corrective Action Reports | Project QAPP | Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan. | WESTON Quality Manager<br>WESTON Chemist<br>Laboratory PM, EPA PHILIS Lab, Eurofins Lab and Pace Analytical Energy Lab |

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## Worksheet 36 — Data Validation (Steps IIA and IIB) Procedures

(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Data validation includes a determination, where possible, of the reasons for any failure to meet method, procedural, or contractual requirements, as well as an evaluation of the impact of such failure on the overall data set. Data validation applies to activities in the field and analytical laboratory.

Data validation is typically performed by person(s) independent of the activity being validated. At a minimum, it is preferable that the validator does not belong to the same organizational unit with immediate responsibility for producing the data set.

### Validation (Steps IIa and IIb) Process Table

| Step IIa/IIb | Validation Input | Description | Responsible for Validation |
|---|---|---|---|
| IIa | Field logbook, field sampling sheets, and sampling SOPs | Review field logbook, field sampling sheets, and other sampling records to ensure that sampling and documentation procedures specified in the sampling SOPs were performed. To be performed annually, at a minimum, or after first sampling round when new personnel are added to the sampling team. Field audit finding will be documented in a brief checklist-style report. | Project Team Leader, Chemist and/ or QA officer |
| IIa | Laboratory data package, QAPP and analytical methods | Conformance to QAPP and Method – After receipt of the laboratory data package, confirm that samples were analyzed by the requested method and that all procedures required by the QAPP was followed. Review laboratory narrative to determine whether any method deviations were performed and QC outliers were documented. | Project Chemist<br>Data Validator<br>Quality Manager |
| IIb | Laboratory data package, QAPP and analytical methods | Comparison of laboratory QC results to Measurement Performance (MPC) – After receipt of the laboratory data package, review QC results and evaluate whether QC samples met MPC specified in the QAPP. Prepare data validation report noting QC outliers and any data qualifiers applied to sample data. | Project Chemist<br>Data Validator<br>Quality Manager |
| IIb | Field laboratory or fixed laboratory report | Quantitation Limits – Upon receipt, check that soil sample results were reported on a dry weight basis. Confirm that sample results met the project quantitation limits specified in the QAPP. | Project Chemist<br>Data Validator<br>Quality Manager<br>Data Manager |

| | | | |
|---|---|---|---|
| IIa | EDD | Format – After receipt of electronic deliverables, confirm that EDD data format is correct and complete and that results are reported in EPA Scribe reporting format (e.g., MDL,RL) and match the hardcopy and/or pdf data package. | Project Chemist<br>Data Validator<br>Quality Manager<br>Data Manager |

Validation will be performed on all laboratory analytical data unless a defined quantity or percentage of samples is identified by the EPA in the Technical Direction Document or during the project scoping meeting on a site-specific basis. Project validation criteria as per QAPP Worksheets 12, 15, 19 & 30, and 28 and cited EPA SW-846 methodology will be used. VOC and SVOC data from the EPA PHILS mobile laboratory will be verified and validated using a Stage 2A validation, as described in the EPA *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (January 2009). Validation qualifiers will be applied using the following hierarchy: Region 6 UFP-QAPP for Hurricane Harvey; the site-specific SAP, FSP, or QAPP; *EPA National Functional Guidelines for Organic Data Review* (Appendix B); *EPA National Functional Guidelines for Inorganic Data Review* (Appendix C); and analytical methods from EPA Publication SW-846; and the laboratory-specific SOP. Methods for which no data validation guidelines exist will be reviewed following the guidance deemed most appropriate by the data validator or EPA.

The data validator will receive all laboratory packages and analytical results electronically. Additionally, the validator will be required to submit final validation reports via PDF format and must provide an annotated laboratory analytical result electronic data deliverable (EDD) with applicable data validation qualifiers. Approved data will be released to the EPA for reporting.

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## Worksheet 37 — Data Usability Assessment

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Data usability assessments will be performed in accordance with EPA *Guidance for Data Useability in Risk Assessment, September 1992* and *Data Quality Assessment, A Reviewer's Guide, February 2006*, or as directed by EPA. This worksheet documents procedures that will be used to perform the data usability assessment (DUA). The DUA is performed at the conclusion of data collection activities using the outputs from data verification and data validation (i.e., data of known and documented quality). It is the data interpretation phase, which involves a qualitative and quantitative evaluation of environmental data to determine whether the site data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective evaluation of the systematic planning process, and involves participation by key members of the project team. The DUA evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence.

Personnel (organization and position/title) responsible for participating in the data usability assessment may include, but not be limited to:

- WESTON SOW Manager;
- WESTON Quality Manager (or designee);
- WESTON Risk Assessor (if required);
- WESTON Chemist;
- WESTON PTL;
- WESTON Statistician (if required).

Based on project-specific oversight responsibilities and analytical scopes, this data usability assessment worksheet outlines the approach that will be taken as the analytical scope expands on a project-specific basis. The following general steps will be followed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

**Step 1 – Review the project's objectives and sampling design**: This includes reviewing the DQOs and MPC to make sure they are still applicable. The sampling design should be consistent with stated DQOs.

**Step 2 – Review the data verification and data validation outputs**: Graphs, maps, and tables can be prepared to summarize the data. Deviations from activities planned in the site-specific FSP should be considered, including samples not collected (potential data gaps), holding time exceedances, damaged samples, impact of non-compliant PE sample results, and SOP deviations. The implications of unacceptable QC sample results should be assessed.

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

**Step 3 – Verify the assumptions of the selected statistical method:** Verify whether underlying assumptions for the selected statistical methods (if specified in the SAP, FSP, or QAPP) are valid. Common assumptions include the distributional form of the data, independence of the data, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions usually are not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may need to be selected.

**Step 4 - Implement the statistical method:** Implement the statistical procedures, if specified in the site-specific SAP, FSP, or QAPP, for analyzing the data and review underlying assumptions. For a decision project that involves hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") consider the consequences of selecting the incorrect alternative; for estimation projects (e.g., establishing a boundary for surface soil contamination), consider the tolerance for uncertainty in measurements.

**Step 5 – Document data usability and draw conclusions:** Determine whether the data can be used as intended, considering any deviations and corrective actions. Discuss whether DQOs were achieved based on comparison with the site DQIs. Assess the performance of the sampling design and identify limitations on data use. Update the conceptual site model and document conclusions. Prepare a DUA report or include the data usability summary in the final site report. The DUA can be in the form of text and/or a table.

The data usability assessment is considered the final step in the data evaluation process. All data will be assessed for usability regardless of data evaluation/validation process implementation. Data usability goes beyond validation in that it evaluates the achievement of the DQOs based on the comparison of the project DQIs and site-specific SAP, FSP, or QAPP with the obtained results. The results of the data usability assessment, and particularly any changes to the DQOs necessitated by the data not meeting usability criteria, will be communicated in accordance with Worksheet 6.

Primarily, the assessment of the usability will follow procedures described in appropriate EPA guidance documents, particularly *Guidance for Data Useability in Risk Assessment* (Publication No. 9285.7-09A, April 1992)(Appendix Q), and will be conducted according to the process outlined below.

1. **Sampling and Analysis Activities Evaluation**: The first part of the data usability evaluation will include a review of the sampling and analysis activities in comparison to program or site-specific DQIs and this Project QAPP in conjunction with the site-specific SAP, FSP, or QAPP. Specific limitations to the data (i.e., results that are qualified as estimated [J/UJ], or rejected [R], will be determined and documented in the site's database).

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

2. **Achievement of DQIs**: The second part of data usability pertains to the achievement of the program-specific DQIs. Each investigator will compare the performance achieved for each data quality criterion against the expected and planned performance. In general, this comparison will follow from the DQIs used to define each DQO. This comparison is the most critical component of the assessment process. Any deviation from planned performance will be documented and evaluated to determine whether corrective action is advisable. Potential corrective actions will range from re-sampling and/or reanalysis of data, to qualification or exclusion of the data for use in the data interpretation. In the event that corrective action is not possible, the limitations, if any, of the data with regard to achieving the DQOs will be noted.

   In conjunction with the DQI achievement review, the investigators will need to make decisions for the use of qualified values, which are a consequence of the formalized evaluation/validation process. Data qualifiers will be applied to individual data results. Data usability decisions will be made based on the assessment of the usability of each of these results for the intended purpose. Evaluation will describe the uncertainty (bias, imprecision, etc.) of the qualified results. Cumulative QC exceedances from the DQIs may require technical judgment to determine the overall effect on the usability of the data. Decisions about usability of qualified data for use in risk assessment will be based on the EPA document mentioned, which allows for the use of estimated values. Finally, data users may choose to determine final data usability qualifiers as a result of this overall examination and decision process.

3. **Achievement of DQOs**: The final part in the data usability process concerns achievement of the DQOs. Once the data set has been assessed to be of known quality, data limitations have been documented, and overall result applicability/usability for its intended purpose has been determined, the final data assessment can be initiated by considering the answers to the following questions:

   - Are the data adequate to determine the extent to which hazardous substances have migrated or to what extent they were expected to migrate from potential hazardous substance source areas?
   - Do the data collected adequately characterize the nature and extent of potential hazardous substance source areas at the site?
   - Are the data statistically adequate to evaluate on a per chemical and per media basis?
   - Do the data collected allow assessment of hydrogeologic factors, which may influence contaminant migration/distribution?
   - Do laboratory reporting limits attain the applicable state and/or federal standards and/or screening levels?
   - Is the sample set sufficient to develop site-specific removal and disposal treatment methodologies?

**Worksheet 37 — Data Usability Assessment** *(Continued)*
(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

- Have sufficient data been collected to evaluate how factors, including physical characteristics of the site and climate and water table fluctuations, affect contaminant fate and transport?
- Have sufficient data been collected to determine the toxicity, environmental fate, and other significant characteristics of each hazardous substance present?
- Is the data set sufficient to evaluate the potential extent and risk of future releases of hazardous substances, which may remain as residual contamination at the source facility?

Principal investigators, in conjunction with the project team, will formulate solutions if data gaps are found as a result of problems, biases, trends, etc., in the analytical data, or if conditions exist that were not anticipated in the development of the DQOs. It is particularly important that each data usability evaluation specifically address any limitations on the use of the data that may result from a failure to achieve the stipulated DQO.

If the project scope changes, the DQOs will be expanded. The DQOs will address the specific action limits and measurable performance criteria, in order to make appropriate decisions on the analytical data.

DQIs, such as precision, accuracy, representativeness, completeness, comparability and sensitivity, are discussed below.

**Precision**

The most commonly used estimates of precision are the RPD for cases in which only two measurements are available, and the percent relative standard deviation (%RSD) when three or more measurements are available. This is especially useful in normalizing environmental measurements to determine acceptability ranges for precision because it effectively corrects for the wide variability in sample analyte concentration indigenous to samples.

Precision is represented as the RPD between measurement of an analyte in laboratory or field duplicate samples or in duplicate spikes (MS/MSD or LCS/LCSD). RPD is defined as follows:

$$RPD = \frac{|C_1 - C_2|}{\frac{C_1 + C_2}{2}} \times 100$$

Where:
$C_1$ = First measurement value
$C_2$ = Second measurement value

The RPD for field duplicate samples provides a tool for evaluating field and analytical precision of the sample matrix at a specific sampling location.

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Precision, when represented as the %RSD between more than two replicate measurements, is calculated by dividing the standard deviation (SD) of the measurements by the mean value for the measurements ($\bar{x}$) then multiplying by 100. For example, the precision between calibration standard Relative Response Factors (RRFs) is evaluated using the %RSD between a minimum of five replicates. %RSD is mathematically expressed by the formula:

$$\%\text{RSD} = \frac{\text{SD}}{\bar{x}}\ x\ 100$$

The mathematical formula for SD is:

$$\text{SD} = \sqrt{\frac{\sum_{i-1}^{n}(xi - \bar{x})^2}{(n-1)}}\ x\ 100$$

where:

$xi$ = each individual value used to calculate the mean
$\bar{x}$ = the mean of $n$ values
$n$ = total number of values

**Accuracy/Bias**

Accuracy control limits are established by the analysis of organic surrogates and laboratory control samples (LCS), which are prepared in clean water and/or solid matrices. The LCS is typically identified as blank spikes (BS) for organic analyses. For multi-analyte methods, the LCS or BS may contain only a representative number of target analytes rather than the full list. The LCS is subjected to all sample preparation and analysis steps. The amount of each analyte recovered in an LCS analysis is recorded, then entered into a database to generate statistical laboratory control limits. Percent recoveries (%R) of the spiked surrogates or spiked analytes in the LCS and duplicate LCS (i.e., LCSD) provides information on how well the analyte can be recovered in a clean sample matrix.

The %Rs for spiked investigative sample analysis (e.g., MS and MSD samples) provides a tool for evaluating how well the analytes recovered in a specific sample matrix. These values are used to assess a reported result within the context of the project DQOs. For results that are outside the control limits provided in the QAPP or site-specific SAP, FSP, or QAPP, the outlier will be noted in the laboratory case narrative. Percent recovery (%R) is defined as follows:

$$\%\ \text{Recovery} = \frac{(A_T - A_0)}{A_F}\ \text{x}\,100$$

Where:

$A_T$ = Total amount recovered in fortified sample
$A_0$ = Amount recovered in unfortified sample
$A_F$ = Amount added to sample

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

Accuracy for some procedures is evaluated as the degree of agreement between a new set of results and a historical database or a table of acceptable criteria for a given parameter. This is measured as percent difference (%D) from the reference value, and is primarily used by the laboratory as a means for documenting acceptability of organic continuing calibration.

The %D is calculated by expressing, as a percentage, the difference between the original value and new value relative to the original value. This method for precision measurement can be expressed by the formula:

$$\%D = \frac{C_1 - C_2}{C_1} \times 100$$

Where:

$C_1$ = Concentration of analyte in the initial aliquot of the sample.
$C_2$ = Concentration of analyte in replicate.

For field measurements such as pH, accuracy is often expressed in terms of bias (B) and is calculated as follows:

$$B = M - A$$

Where:

M = Measured value of Standard Reference Material (SRM)
A = Actual value of SRM

**Sensitivity**

Sensitivity is the ability of the analytical test method and/or instrumentation to differentiate between detector responses to varying concentrations of the target analyte. Methodology to establish sensitivity for a given analytical method or instrument includes establishing reporting limits (RLs) and method detection limit (MDL) studies. The findings of the usability of the data relative to sensitivity will be included in the report, including any limitations on the data set and/or individual analytical results.

Statistical tests may be conducted to identify potential outliers. Potential outliers will be removed if a review of the field and laboratory documentation indicates that the results are true outliers.

Method sensitivity is typically evaluated in terms of the MDL and is defined as follows for many measurements:

$$MDL = {}^{t}(n - 1, 1 - \alpha = 0.99)(s)$$

Where:

$s$ = Standard deviation of the replicate analyses
${}^{t}(n - 1, 1 - \alpha = 0.99)$ = Student's t-value for a one-sided 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

$n$ = Number of measurements
$\alpha$ = Statistical significance level

**Representativeness**

Representativeness is the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. It is a qualitative parameter that depends on proper design of the sampling program.

Data representativeness for this project is accomplished by implementing approved sampling procedures and analytical methods that are appropriate for the intended data uses, and which are established within the site-specific SAP, FSP, or QAPP.

Field personnel will be responsible for collecting and handling samples according to the procedures in this UFP-QAPP and the site-specific SAP, FSP, or QAPP so that samples are representative of field conditions. Errors in sample collection, packaging, preservation, or chain-of-custody procedures may result in samples being judged non-representative and may form a basis for rejecting the data.

**Comparability**

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another, whether it was generated by a single laboratory or during inter-laboratory studies. The use of standardized field and analytical procedures ensures comparability of analytical data. Sample collection and handling procedures will adhere to U.S. EPA-approved protocols. Laboratory procedures will follow standard analytical protocols, use standard units, use standardized report formats, follow the calculations as referenced in approved analytical methods, and use a standard statistical approach for QC measurements.

**Completeness**

Project-specific completeness goals account for all aspects of sample handling, from collection through data reporting. The level of completeness can be affected by loss or breakage of samples during transport, as well as external problems that prohibit collection of the sample. The following general formula is used for determining the percent complete:

$$\text{Completeness} = \frac{A}{B} \text{ x} 100$$

Where:

A = Actual number of measurements judged valid (the validity of a measurement result is determined by judging its suitability for its intended use)
B = Total number of measurements planned to achieve a specified level of confidence in decision making

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

The formula for sampling completeness is:

$$\text{Sampling Completeness} = \frac{\text{Number of locations sampled}}{\text{Number of planned sample locations}} \text{ x } 100$$

An example formula for analytical completeness is:

$$\text{Metals Analytical Completeness} = \frac{\text{Number of Usable Data Points}}{\text{Expected Number of Usable Data Points}} \text{ x } 100$$

**Project Completeness Goals**

| Task | Subtask | Completeness Goal |
|---|---|---|
| Sampling | Sample Collection | 95% |
| Field Measurements | Conductivity | 100% of applicable collected samples |
| | pH/Turbidity/Dissolved Oxygen | 100% of applicable collected samples |
| Analytical Measurements | All Laboratory Analyses | 95% of collected analytes |
| | | 90% of each target analyte |

## Worksheet 37 — Data Usability Assessment *(Continued)*

(UFP-QAPP Manual Section 5.2.3 and Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

**Overall Data Usability Summary:**

- Evaluate whether the site-specific and/or project-required quantitation limits listed in Worksheet 15 were achieved for non-detected site contaminants. If no detectable results were reported and data are acceptable for the verification and validation steps, then the data are usable.
- If detectable concentrations are reported and the verification and validation steps are acceptable, the data are usable.
- If verification and validation are not acceptable, the data may either be qualified as estimated (J, UJ) for minor QC deviations that do not affect the data usability or rejected for major QC deviations affecting data usability. The impact of rejected data will be evaluated and re-sampling may be necessary. Use of estimated data will be discussed in the project report.
- For statistical comparisons and mathematical manipulations, non-detected values will be represented by a concentration equal to one-half the sample-specific reporting limit. Duplicate results (original and duplicate) will not be averaged for the purpose of representing the range of concentrations. However, the average of the original and duplicate will be used to represent the concentration at that sample location.

**Graphics**

Graphic figures will be generated to depict sample locations, as needed. Also, if necessary, figures will be generated to represent contaminant concentrations at each sampling location. Each figure will contain a detailed legend.

**Reconciliation**

PQOs will be examined to determine whether the objectives were met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the data verification and validation, DQIs, and MPC assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined whether the PQO was met and whether project action limits were exceeded. As part of the reconciliation of each objective, conclusions will be drawn, and any limitations on the usability of any of the data will be described in the final report.

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